ARMY LIBRARY
ROOM 1A518
THE PENTAGON
WASHINGTON 25, D. C.
C-AFR

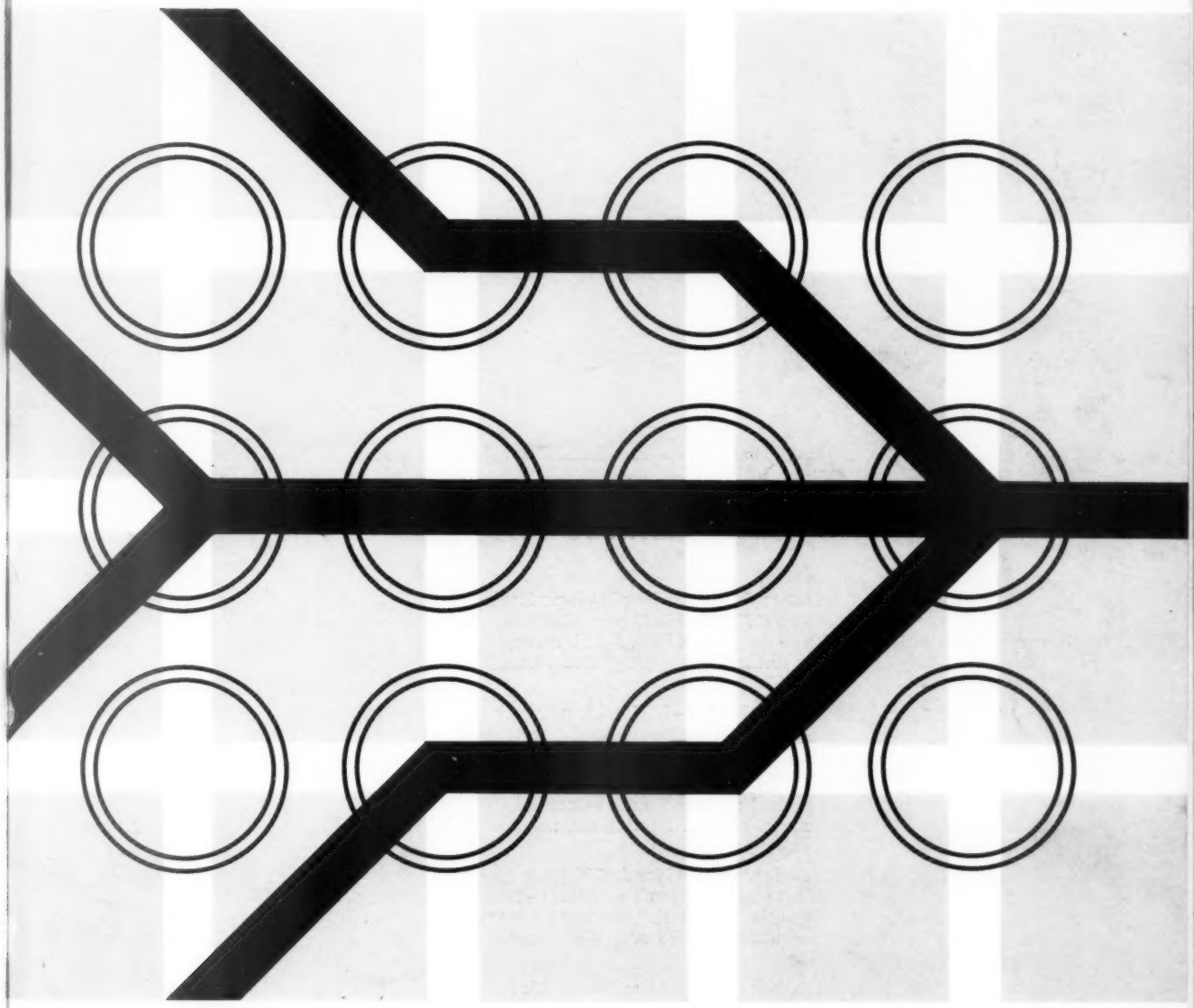
REFERENCE COPY

RECEIVED
13 JUL 1959

JULY, 1959
$1

ARMED FORCES management

PUBLISHED FOR THE ARMY, NAVY, AIR FORCE, COAST GUARD AND MARINE CORPS



ELECTRONIC DATA PROCESSING PROGRESS ISSUE

The Impending EDP Personnel Crisis ..... p. 13

So You Think You Want a Computer ..... p. 16

...NEWS IS HAPPENING AT NORTHROP

Now in production – the world's first space-age trainer – USAF T-38 Talon. Mission: to train tomorrow's airmen in the art of supersonic flight.

UNIQUE NORAIR MANAGEMENT METHODS CUTTING SPACE-AGE AIRCRAFT COST !

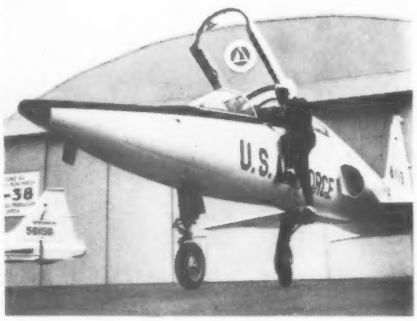
T-38 Talon is the first of Northrop's new family of high-performance, low-cost aircraft produced at Norair, Hawthorne, California. Using an inherently economical design as a base, Norair management is reducing costs even further by applying three Norair-created methods.

Pace – Performance And Cost Evaluation – is Norair's new way to measure group effectiveness. Its successful application to the T-38 program has created wide military and civilian interest.

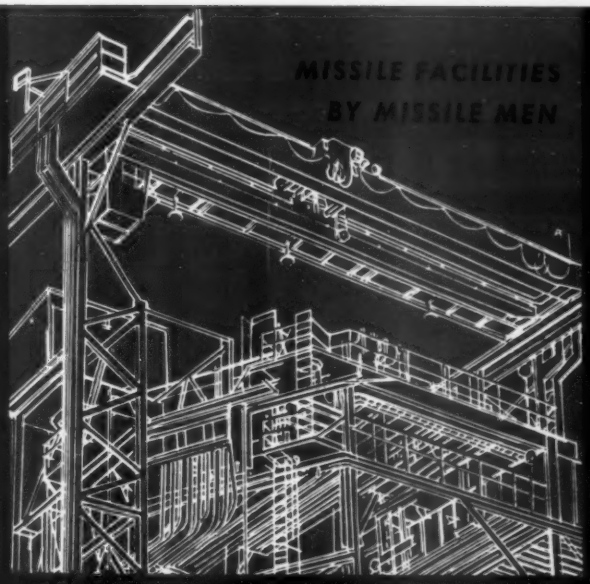
Norair's Target Cost Control constantly monitors all areas of cost – from preliminary design to final assembly. Such a continuing control system keeps production costs at a minimum, assures maximum efficiency.

Years-Ahead Production Techniques utilize Norair's 20 years of airframe experience. In the area of honeycomb structures – for example–Norair-designed high-accuracy forming, contour milling, and adhesive bonding techniques trim T-38 costs – producing higher-quality hardware for less money.

Norair combines these and other management methods with its completely integrated research and development facilities. Result: earlier and more effective answers to the problems of free-world defense in the space age – at minimum cost.



NORAIR *formerly Northrop Division*
HAWTHORNE, CALIFORNIA
A Division of **NORTHROP CORPORATION**



AEROJET

for

engineering

services

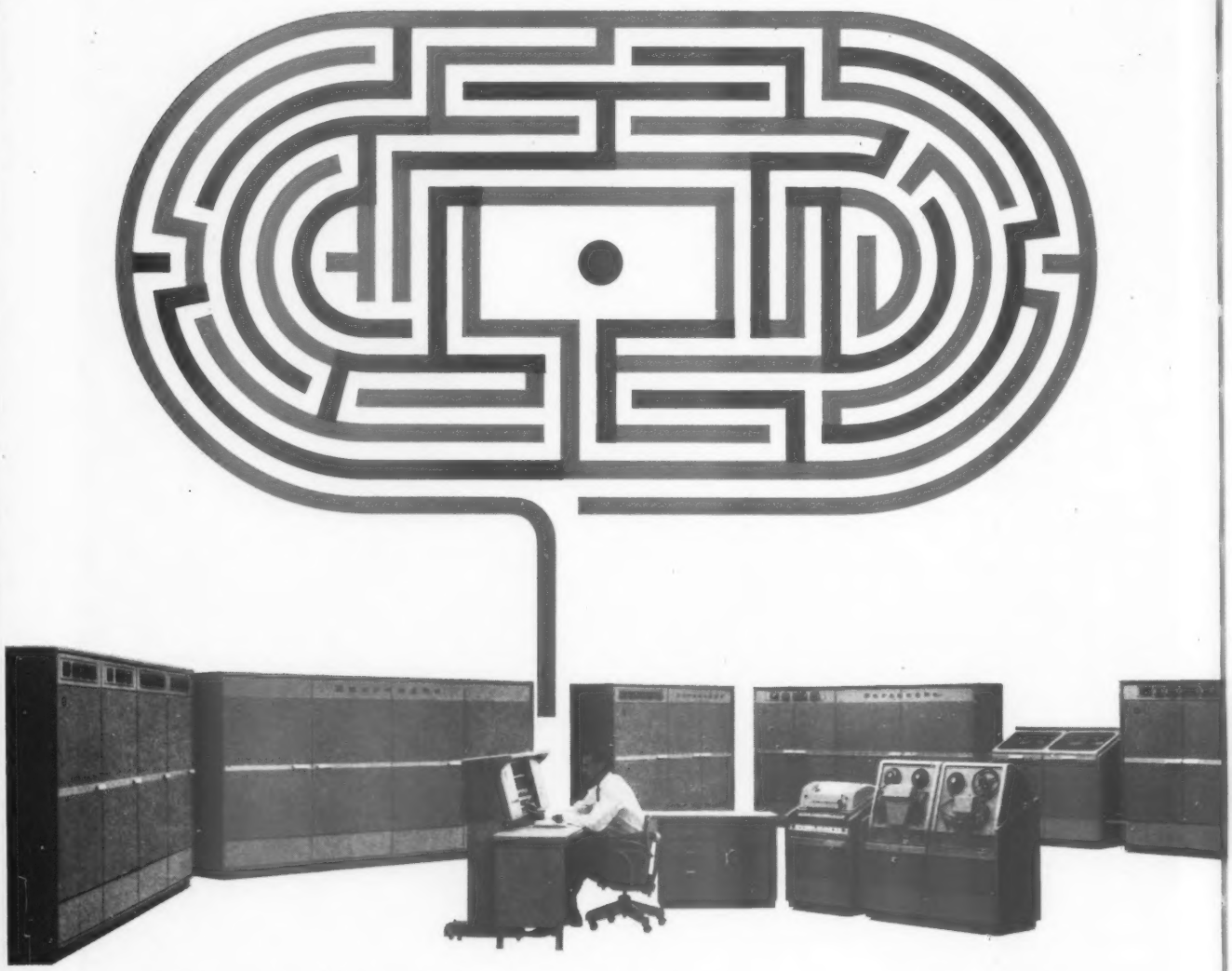
Aerojet-General offers complete engineering services for the design and construction of all types of missile facilities:

- Production
- Component Testing
- Static Testing
- Launching
- Missile Ranges
- Instrumentation and Control
- Data Systems

AEROJET-GENERAL CORP.®

THE GENERAL TIRE

A SUBSIDIARY OF THE GENERAL TIRE & RUBBER COMPANY



solving today's problems today: Burroughs 220 Computer

In scientific computation and business data processing, the new Burroughs 220 is delivering tangible results today. Linking a powerful digital computer to equally powerful input-output subsystems, the 220 offers balanced performance at the lowest application cost. Its expandable core memory, built-in floating decimal arithmetic, vast Datafile magnetic tape capacity and the multiple-card processing ability of Cardatron make this the most powerful system available in the medium price field. The 220 is just one part of a complete line of advanced Burroughs electronic data processing equipment...now in production...now at work in hundreds of installations...supported by an outstanding team of computer specialists. Write today for 220 brochure, ElectroData Division, Pasadena, California.

Burroughs Corporation

"NEW DIMENSIONS/in electronics and data processing systems"

ARMED FORCES management

JULY, 1959

PUBLISHED FOR THE ARMY, NAVY, AIR FORCE, COAST GUARD AND MARINE CORPS

Volume 5—No. 10

FEATURES

The Impending EDP Personnel Crisis 13

Present personnel policies regarding Electronic Data Processing technicians and professionals are far from the best in the world. A sweeping study conducted by Bureau of the Budget has shown that the present system is going to create many long range headaches—in addition to those already existing. This is the story . . .

So You Think You Want a Computer 16

Electronic data processing offers many advantages in many different situations, but it is no panacea. Before making any sort of installation of EDP, it would be well worth the time of those concerned to read this article. Author Cdr. W. Vance Fowler sets down the important points to consider.

How PERT Predicts for the Navy 19

Program Evaluation Review Technique—called PERT by the Navy—offers a new and valuable application for EDP. The measure of its worth is the world-wide interest that the system has generated.

Comparison of Major Computer Systems 24

EDP and Marine Corps Supply 27

A successful application of Electronic data processing has been set up for operation at the Albany, Ga. Marine Corps Supply Center. Commander Brig. Gen. W. P. Battell tells how it works.

Creating Chaos with EDP 30

This is the do-it-yourself guide for building a warm, secure niche in brand-new, blooming computer business. Keep your head down and your estimates up—but above all remember this: if anything goes wrong, you had no responsibility. And this is how to organize it so that's true.

DEPARTMENTS

In My Opinion	4	Procurement Trends	35	Your Investment Future	47
Editorial	5	Research Rundown	39	Dates to Circle	48
Washington Background	9	Association Newsletter	43	Advertisers Index	48

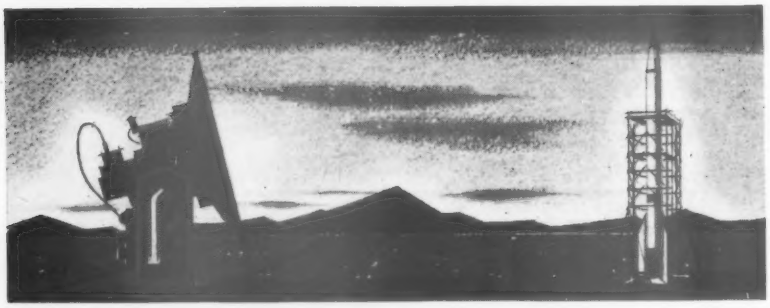
FEATURED NEXT MONTH

Quality Control and the AF Missile Program . . . A Rundown on the ASW Situation . . . Does Lowest Bid Mean Lowest Price?

Published monthly by Professional Services Publishing Company, a subsidiary of American Aviation Publications, Inc., Washington, D.C. Printed at The Telegraph Press, Harrisburg, Pa. Accepted as controlled circulation publication at Harrisburg, Pa. and Washington, D.C.

Copyright 1959 by the Professional Services Publishing Company.

Title registered U.S. Pat. Off. Four weeks' notice before next publication date required for change of address. Subscription Price: $10.00 a year in U.S. and Canada, $15.00 overseas.



Will Available COMPONENTS Keep Pace With SPACE AGE PROGRESS?

Systems designers have done a phenomenal job of advancing the state of the art in missile and space effort. Through necessity, the lack of suitable components has been compensated for by the use of redundency and other compromises. Eventually, however, the rapid advance in systems development may stall as its capabilities outstrip the potential of the individual components.

Let us not permit this situation to develop.

Many components manufacturers have, because of lack of adequate research and development funds, stretched their resources to a dangerous limit to meet these needs. We do not believe that this is enough. Means must be found whereby some of the Research & Development funds, being spent by the Military and Prime Contractors, is funneled down to component manufactures (specialists in their fields) in order to assure that components keep pace with systems development.

If this is done, there will be no practical limit to the advances which will result.

George J. Pandapas
President

ELECTRO TEC CORP.

P. O. Box 37P, SOUTH HACKENSACK, N. J.

Products of Precision Craftsmanship

For more facts request No. 1 on reply card.

In My Opinion

Editorials Praised

Your editorial entitled "The Authority to be Wrong" in the May Issue of ARMED FORCES MANAGEMENT could not have hit the nail's head any squarer. Good job!

Lt. Joe O'Neal
Richards-Gebaur AFB, Mo.

I have just read with great interest your May editorial and the June one also. It seems that the May transcription hinges directly on the June, i.e.: if enough channels approve a measure then there is no one to "point the finger at" if things go amiss.

Regarding the May editorial (The Authority to be Wrong), I am a procurement officer and I have been advised that while the article means well, it doesn't apply to military procurement as one must be right 100% of the time or else!

With *some* senior officers preaching this gospel of "Don't you make a mistake, it might mar my record," how in the world can the service expect to retain young men and keep morale up? They go all out to do everything possible to keep what might be considered extra-curricular morale high i.e.: base theatres, commissaries, housing, appliances, clubs, etc. But for God's sake don't make a decision by yourself. I say put your faith and trust in your junior officers—if their decision was wrong, charge it to experience and take steps to see that the same one isn't made twice. Don't subject them to "crucifixion" or voice your lack of faith of trust—stand by them and point out errors in a constructive manner. After all, we learn by doing.

This letter may be somewhat prejudiced by my own situation—I am not a career officer, but do have over four years on active duty and I have seen enough.

Name withheld on request

Liked Renegotiation Story

. . . Our Procurement Division feels that this (How Renegotiation Cuts Costs, May ARMED FORCES MANAGEMENT) is an excellent article and is eager to bring it to the attention of Transportation Corps people who are involved in this type of work . . .

R. T. Carroll
Technical Liaison Officer
Office of Chief of Transportation
Department of the Army

Executive Editor
C. W. Borklund

Associate Editor
Fred Hamlin

Art Director
William H. Martin

Asst. Art Director
Bacil Gulley

Production
John Walen

Asst. Production Mgr.
Elsie Gray

Advertising Sales Manager
Arthur J. Newfield

Advertising Service Manager
Lee Martin

Circulation Manager
Eugene White

★

Wayne W. Parrish . . . . . **Publisher**

Leonard Eisorer . **General Manager**

Editorial and Advertising Offices:
1001 Vermont Ave., N.W.,
Washington 5, D.C.
Phone: STerling 3-5400.

★

Regional Advertising Offices

New York 17, New York
17 East 48th Street
PLaza 3-1100

Beverly Hills, Calif.
8929 Wilshire Blvd.
OLeander 5-9161

Chicago 2, Ill.
139 N. Clark St.
CEntral 6-5804

Detroit 2, Mich.
201 Stephenson Building
TRinity 5-2555

Geneva, Switzerland
Anthony Vandyk
European Direcor
10 Rue Grenus
Phone: 321044
Cable: AMERAV GENEVA

London W.I., England
Frank V. Norall
Norall & Hart
28 Bruton St.
GRovenor 8356

★

Unsolicited manuscripts should be accompanied by a stamped, self-addressed return envelope. Armed Forces Management does not assume responsibility for the return of any unsolicited material.

Con Man or Catalyst?

DEFENSE contractors, the smart ones who are still around, have been assuming for years that they hired retiring military officers for at least one of the only three reasons:

1—Professional knowledge—years of successfully managing several different key segments of the largest business in the world has to develop in any man a valuable managerial capability. (Gen. E. W. Rawlings, now working for General Mills, probably forgot, as head of the Air Materiel Command, more management know-how than most industry presidents will ever learn.)

2—Pure technical competence—Brig. Gen. Joseph A. Holly, USA retd., now with Food Machinery and Chemical Corp., is given no small share of the credit for helping halve the cost to the Army of FMCC's Armored Personnel Carrier just because he knew the field army's technical APC needs and how best to fill them.

3—Prestige—a big name on the board of directors attracts other big names and the contacts are just good business.

All of these reasons are based, to a greater or lesser extent, on industry's desire to get as close as possible to and understand better the huge market it is trying to serve. Last month, industry was informed by the U.S. House of Representatives (125 of them at least) that Congress has not been fooled one bit.

The Real Reason is that retired officers make terrific sure-fire salesmen to their "buddies" still in the service. When they first heard this, military officers with the broadest sense of humor ("wide as the whole wide world is wide") chuckled. They should have slashed their wrists instead. For it is pretty obvious to anyone even vaguely familiar with Pentagon operations that junior Congressman crusader Alfred E. Santangelo (D-N.Y., and the first man to spot "the truth") is absolutely correct.

What could be more logical? Certainly, men like Generals Ridgway, Gavin, Irvine, Rawlings, Admiral Radford, with a lifetime of highly responsible, relatively low-paid devotion to country, are going to be very happy to return to the Pentagon, ringing doorbells, asking former subordinates for multi-million dollar contracts. There *are* procurement laws but we all know nobody pays any attention to *them*.

Santangelo's McCarthyesque ability to spot a thief under every garrison cap is unequalled. His prestidigious juggling of fact and fancy is unmatched anywhere short of eastern Europe.

(One suggestion: The House should call Douglas MacArthur as first witness in its planned inquiry, let Santangelo accuse him of dipping a hand in the public trough for private gain, and prove whether the Capitol dome will merely disintegrate or really is strong enough to go into orbit.)

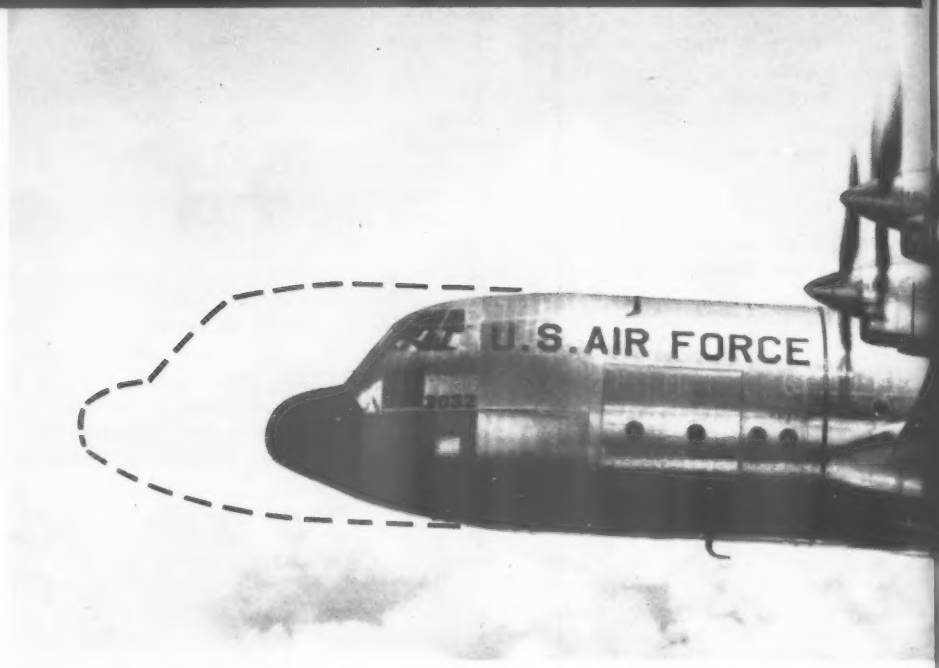
We suggest, however, that Santangelo is chewing on only part of his newly found piece of candy. How about all those civilians with real political influence who once held top Pentagon posts? Examples: the Military being as corruptible as it is, Frank Pace probably ought to resign as board chairman at General Dynamics. Neil McElroy certainly can't go back to work for Proctor and Gamble.

Lost, unfortunately, in Santangelo's irrelevant fog and furor is the legitimate problem which prompted it—how to handle negotiated contracting, a subject on which Defense badly needs Congressional opinion. There are plenty of unanswered questions in this field. But it is fairly obvious that an imposition on employment is not one of them. The imposition, in catching a few minor violators, would dry up a large reservoir of experienced talent, an irreplaceable link between Defense needs and industry's ability to accurately understand and fill them.

It should be the fervent hope of the (few remaining) honest men in the Pentagon that the House will lure Congressman Santangelo back into his cage before he succeeds in doing some real damage.

Bill Borklund

New Lockheed Super Hercules
Big brother of U.S. Tactical Airlift champ

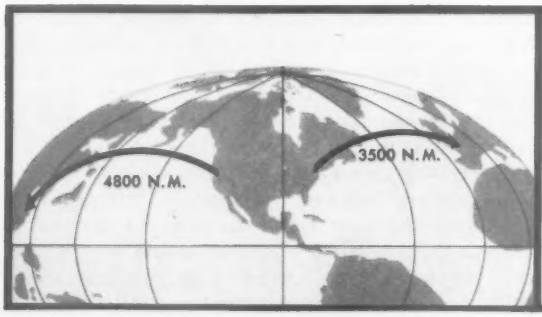


An ocean-spanning logistic support transport, the GL-207 Super Hercules is a "stretch" version of the C-130 Hercules—famous for its headline-making feats in over two years of service with USAF's Tactical Air Forces.

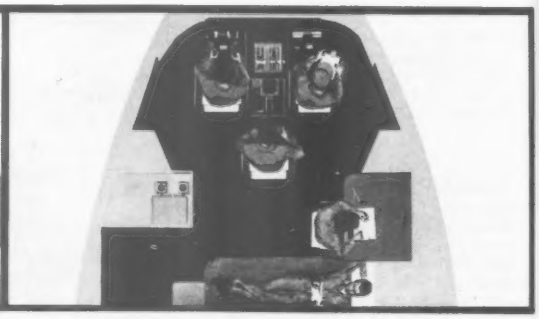
The GL-207 Super Hercules has a fuselage 23 feet longer than its brawny brother's. Its wing span is 12 feet greater... its propeller-diameter has been expanded by 2½ feet... internal fuel capacity has been increased to 10,236 gallons for greater range (pylon tanks add another 1800 gallons).

Powered by four new GM-Allison T-61 Prop-Jet engines, the Super Hercules provides nonstop trans-Atlantic and trans-Pacific transport for personnel, vehicles, palletized/containerized freight, missiles, and general cargo. Maximum payload: 78,000 pounds.

The GL-207 Super Hercules will come off production lines at Lockheed's Georgia Division. Like all Lockheed aircraft, the Super Hercules is designed for long life, easy maintenance, and low cost of operation. Result: maximum airlift, for minimum dollars.

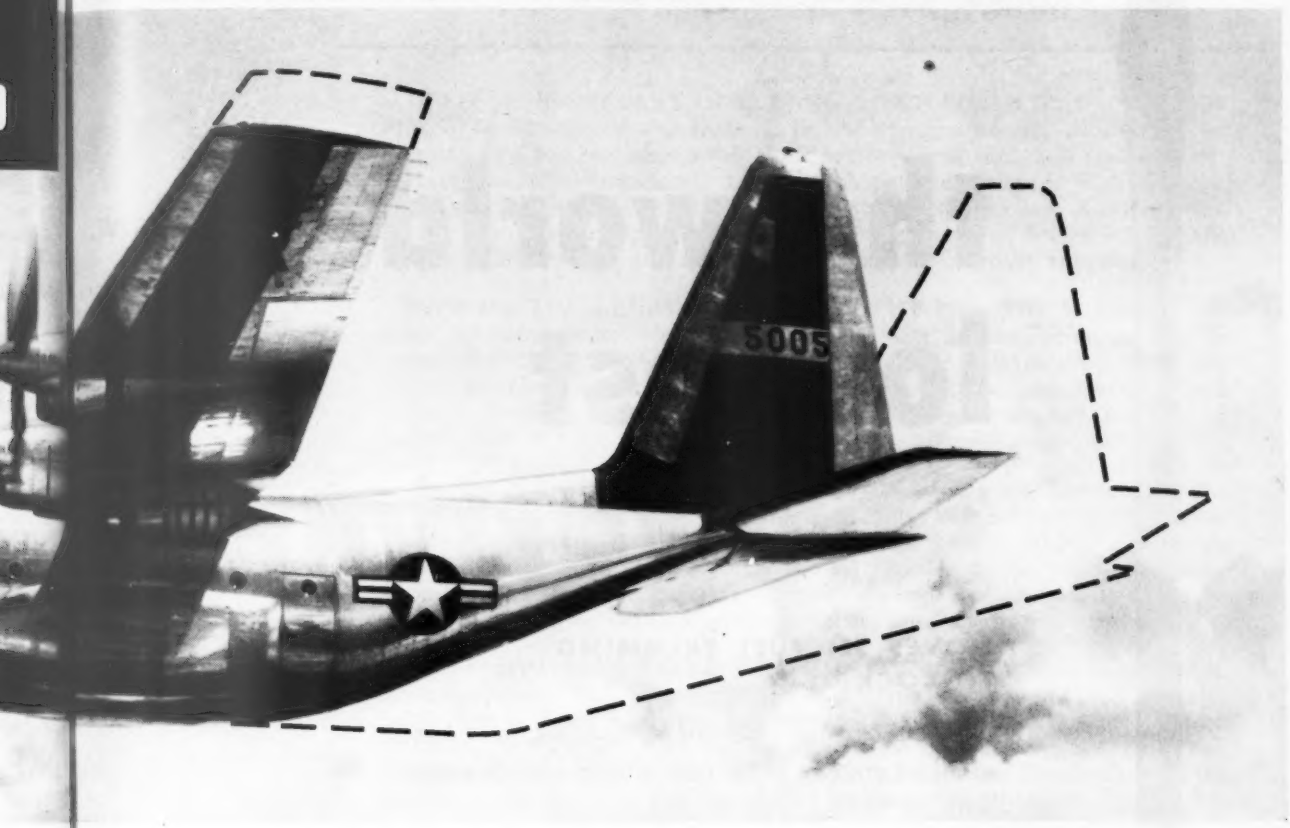


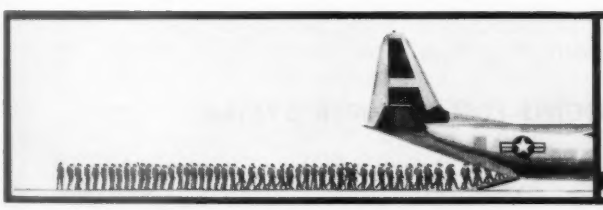
Transporting 50,000-pound MATS cargoes nonstop across the Atlantic—or, with pylon tanks, spanning the Pacific nonstop carrying 16-ton loads 4,800 nautical miles—is Super Hercules' mission.



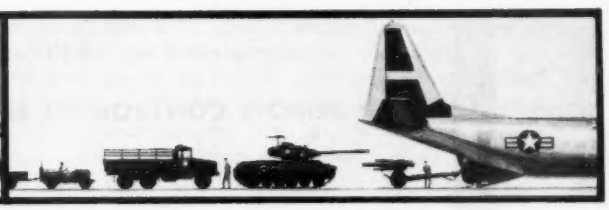
Crew efficiency on long flights is assured by flight station design approved by experienced transport pilots. Super Hercules' crew compartment includes relief crew sleeping space, galley facilities for hot meals in flight.

Dotted line shows size of GL-207 Super Hercules, superimposed over now-in-service C-130 Hercules.

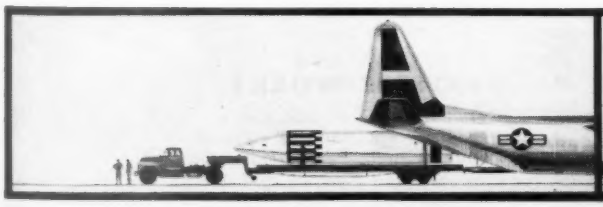




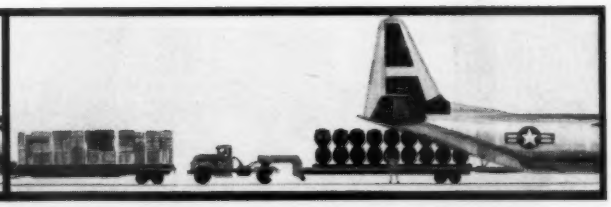
152 combat-ready troops, or 116 paratroopers can be transported in the GL-207. With airline type seats, the Super Hercules can carry 105 persons comfortably.



Combat vehicles can be driven up the hydraulically controlled ramp-door of the end-loading GL-207 Super Hercules—a vital time-saver in emergency situations.



Big ballistic missiles—assembled, with boosters, on trailers, or dollies—fit easily into the huge pressurized cargo compartment of the GL-207 Super Hercules.



Assorted cargo—runway matting, jet engine containers, fuel and oil drums, etc.—can be speedily loaded onto Super Hercules' truck-high cargo floor.

LOCKHEED

JET TRANSPORTS • JET FIGHTERS • JET TRAINERS • COMMERCIAL & MILITARY PROP-JET TRANSPORTS • ROCKETRY
BALLISTIC MISSILE RESEARCH & DEVELOPMENT • WEAPON SYSTEM MANAGEMENT • ANTI-SUBMARINE PATROL AIRCRAFT
NUCLEAR-POWERED FLIGHT • ADVANCED ELECTRONICS • AIRBORNE EARLY-WARNING AIRCRAFT • AIRPORT MANAGEMENT
NUCLEAR REACTOR DESIGN & DEVELOPMENT • GROUND SUPPORT EQUIPMENT • WORLD-WIDE AIRCRAFT MAINTENANCE

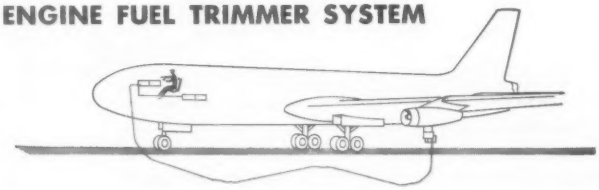
the world's longest screwdriver

MOVES JET FUEL TRIMMING TO COCKPIT

Now only 1 man—instead of 3—trims fuel controls of all jet engines... faster... with greater accuracy... without hazard... all by remote control!

Eliminates exposure to dangerous noise and heat when trimming at the engine.

EXCLUSIVE **LEAR REMOTE CONTROL JET ENGINE FUEL TRIMMER SYSTEM**



G-6

HOW IT WORKS

In a matter of seconds, a servo-adapter combination is clamped directly to the fuel control on the engine to be adjusted. This servo-adapter is attached to a remote controller (usually in the cockpit) by means of an electrical cable. Thus one man can make all idle, military power and water injection adjustments.

LEAR

ELECTROMECHANICAL DIVISION
Specializing in actuating components and control systems – electro-mechanical, hydraulic, pneumatic.
110 Ionia Ave. N. W.
Grand Rapids 2, Mich.

Washington Background

DEFENSE SECRETARY McELROY'S MUCH-PUBLICIZED "MASTER PLAN" for Continental Air Defense, i.e. the Hercules-Bomarc debate, will be accepted by Congress pretty much as he has requested—although Congress will probably not miss a chance to unload some politically inspired wrist slapping first. Only significant result of the controversy, in which neither Army nor Air Force wanted to participate in the first place, has been that neither service will receive as much money to support their programs as originally requested.

HOW DO YOU LEGISLATE EMPLOYMENT PRACTICES? Subject, first raised by Congressional elements least familiar with defense operations, will be investigated by House Armed Services Investigations Subcommittee early this month. Net result will be little real change over present laws governing ex-officers selling to former service, even though Congressional committees will, for political reasons, have to come up with something.

NAVY'S CHANCE FOR BUDGET FUNDS to buy another carrier have brightened considerably in the last few weeks, due in no small part to the backing of Senate Appropriations Committee member Dennis Chavez, (D-N.M.). Congress cancelled request for funds originally due in no small part to strong opposition (from the ICBM missile boys) and a weak, divided Navy defense (some Navy elements favoring conventional powered carrier, others the nuclear version.

NAVY ADMIRALS, FACED WITH THE POSSIBILITY of no carrier at all, have temporarily buried arguments over which type of power will push the ship, have convinced key Congressional members (such as Chavez) that we need *a carrier*. Pentagon observers privately voiced the opinion Navy should go one step further, push hard for what, in the long run, will be the least costly ship, the nuclear powered version. Chances of final approval: "Slightly better than fair."

PENTAGON REACTION TO "REVELATIONS" of the Government Accounting Office on overspending of funds has been mixed. Feeling runs, generally, something like this: We need to tighten up the operation, but the picture is not nearly as black as GAO would lead people to believe (primarily because they make no attempt to put their disclosures concerning "waste" of dollars in perspective with the total military procurement picture). Next targets for GAO: Some Navy contracts, hearings on which are due to start as AFM goes to press, and one or two contracts let by the Army with which GAO is reportedly "not happy."

REAL OUTCOME OF THE NEGOTIATED PROCUREMENT argument could be as much as a year away from an answer. Only real value of recent Congressional diversionary arguments has been that the services will have a chance to put their procurement house in better order before the main issue—negotiated versus advertising procurement—comes up for pointed debate. Air Force, particularly, is already taking several significant steps. Among them: hiring more auditors to watch their cost and pricing operation more closely; beginning a training course at Air Materiel Command headquarters to train contract specialists in pricing policy.

PENTAGON INVESTIGATION OF HOW WELL FIELD INSTALLATIONS are using Data Processing Equipment is barely off the ground, has already brought to light one significant fact. In the relatively few installations (8 or 9) already visited, one big reason military installations are not saving the dollars they expected is what one officer termed a "cultural lag." His meaning: Officers with the equipment are reluctant to put full faith in it or don't accept its real significance.

THUS THEY CONTINUE TO RETAIN MANY of the manual operations (as protection) and personnel which the machine should replace. Surprising fact number two: Highly competent officers, particularly in the supply field, don't even realize that this is what they are doing. Main reason is being so close to the operation for so long.

BILLETS NEARLY FILLED AT FAA

Nearly three-fourths of the military officers who will eventually be assigned to Federal Aviation Agency have reported to their new jobs, FAA has said.

Of the 140 officers from the three services that will work for FAA under present plans, 120 have been assigned and 103 have reported. Air Force has assigned 69 of its 70 slots, Navy has assigned 38 of its 45, and Army has assigned 23 of the 25 posts it will eventually fill.

Officers that have already reported from Army number 14, from Navy 25 and from Air Force 64. The military personnel at FAA will serve three-year tours, with the possibility of a one-year extension.

Under the present agreement between Defense Department and FAA, "no person detailed or appointed to the Agency will be subject to direction or control by the Department from which detailed or appointed or by any agency or officer thereof directly or indirectly with respect to his responsibilities under the Federal Aviation Acts of 1958 or within the Agency."

RESTORE FUNDS? – McELROY

Defense Secretary Neil McElroy has asked the Senate Defense Appropriations Committee to restore the $1-billion cut from the Administration defense budget by the House.

McElroy also said he did not consider House action granting extra Atlas ICBM funds a "mandate" to spend the money. The funds cut by the House amounted to about 1% of the total bill. Said McElroy, "While we share the (Senate) committee's concern with the increasing costs of weapons and equipment, we do not think the 1% cut is a practical way to accomplish the committee's objective."

McElroy cited at least one program—the AF Mace—where decreased funding would only result in the loss of considerable investment.

WHAT ABOUT RETIRED OFFICERS?

When Alfred E. Santangelo, democrat from New York City's 18th Congressional District, rose on the floor of the House one day last month to propose an amendment to the 1960 Defense Appropriations Bill, he probably had no idea that he was to become the center of conversation.

His amendment: Bar senior military officers from taking jobs with defense industry until at least five years after they leave the service. A stand-up vote missed passing by one. After some more debate, a new vote turned back the amendment 147 to 125—but only after House veterans (including Carl Vinson and F. Edward Hebert) disclosed that the subject was due for a House Armed Services Investigation Subcommittee hearing "very soon." Encouraged by his floor support and the high stacks of headlines (plus the knowledge that his New York constituents are not going to be the least bit unhappy with his prime target, West Coast industrialists), Santangelo has since loosed several broadsides on the subject.

Although Santangelo has gotten the most mileage, he has certainly not been alone in this charge. Concerned over the cost of weapons, Congress has become increasingly frustrated over how to halt the rising prices.

The weapons systems procurement program is highly complex. Most Pentagon procurement officials are convinced, however, that, if not the final answer, at least it is a step, a big step, in the right space age procurement direction. Unfortunately, they have had little chance to prove their case on Capitol Hill.

Legislators, in striving for simplification of the case which can't be simplified, have chewed all around the problem, seen part of the blame for "waste and high prices" in faulty contract administration, in inter-service weapons fights, inflated overhead charges, and now in the "drift" of military officers into industry.

Negotiated procurement is the chief subject of conversation—but this has been pretty well buried by the recent diversions. Hebert committee hearings on the concept had barely scratched the surface when Santangelo touched off the recent explosion—aided in no small part by an "after-the-culprit-has-been-caught" Government Accounting Office disclosure of some "overcharges" in Air Force R & D and prototype contracts.

(It turned out, subsequently, that the Air Force had already recovered most of the $6-million in funds which GAO said it had paid out but Santangelo, using the GAO figures, attributed this excess to ex-officers playing patty-fingers with their "buddies" still in the Pentagon, and the Hill was off and running.)

House veterans most familiar with defense operations have been significantly slow to jump into the headline-grabbing fray, have instead urged "calm and deliberate" hearings. Probable reason: an attempt to put their junior colleagues back on a more orderly course, a desire to keep the principal issue—negotiated versus advertised procurement—from being buried under an avalanche of side issues.

Commented one general, "Too many of what I like to refer to as the 'lunatic fringe' element on the Hill are trying to turn back the procurement clock and either don't realize it or don't care. If we were still buying new weapons under the old government furnished equipment idea of World War II, not only would the equipment be inferior and take longer to produce, but Congress would be getting an annual defense bill that would really rattle their pocketbooks."

RENEGOTIATION EXTENSION OK'D

At AFM presstime, the Senate approved a 30-month extension of the renegotiation act, substantially as it was reported out of the Senate Finance Committee. The bill will now go to conference. The House had approved a four-year extension of the measure, with several changes.

When the bill was reported out of the Senate Finance Committee, that group promised to set up a thorough study of the measure by either the House or Senate Armed Services Committee before the proposed expiration date in Jan. 1962.

Changes stricken by the Senate from the Act—including a mesaure which would allow appeal of Renegotiation Board decisions to the U.S. Tax Court—were influenced largely by Rep. Carl Vinson, chairman of the House Armed Services Committee.

The proposed investigation would be linked to other procurement problems, and the results would be filed with the Joint committee on Internal Revenue, which would round out the study.

REPORT FROM ***ARMA***

The Missile Train—Mobile Sunday Punch

In the foreground above is the missile train—a hit-and-run Sunday punch for our modern Army. In event of war, the train could fire a missile with nuclear warhead, move rapidly miles away, then fire other missiles . . . without becoming a vulnerable stationary target itself. The missile train would be an ever-present threat to the enemy's tactical units over a wide area.

For such imaginative projects as the missile train, which combines maximum mobility with maximum firepower, ARMA has developed an equally imaginative universal navigation system. Not only can ARMA systems rapidly locate and aim all types of Army missiles, but they are applicable to all types of land, sea and air operations. To the Army, ARMA offers precise vehicular navigation systems for use in artillery and missile survey, combat vehicles, tanks, and helicopters as well as remote control types for mine detection and atomic blast survey. Precision navigation systems are ARMA's business from ships to ICBM's and—beyond.

ARMA, Garden City, N. Y., a division of American Bosch Arma Corp. . . . the future is our business.

AMERICAN BOSCH ARMA CORPORATION

LGP-30

ROYAL PRECISION

Here is the low-cost electronic digital computer in greatest demand

Gives you large-capacity electronic computation at desk-side

Operating from any convenient wall outlet, the powerful LGP-30 gives you the full flexibility of stored-program operation with an unusually large non-volatile memory of 4096 words – *2000 more than the next computer in its class!* And it's the lowest-priced complete computer your company can buy!

Because the LGP-30 command structure and controls have been remarkably simplified, you require only minimum computer experience. What's more, you get complete format control . . . alphanumeric input-output via keyboard or punched paper tape. No additional equipment is required for operation although, if desired, a high-speed photoelectric reader – with or without mechanical punch – is available for system expansion.

The greatest computer value in today's market, the LGP-30 requires no expensive installation or air-conditioning . . . may be purchased on either a sale or rental basis. Customer training is free. An extensive library of programs and sub-routines is available – as well as membership in an active users organization. Sales and service facilities are maintained coast-to-coast. For further information and specifications, write Royal McBee Corporation; Data Processing Division, Port Chester, N. Y. In Canada: The McBee Company, Ltd., 179 Bartley Drive, Toronto 16.

ROYAL McBEE · *data processing division*

The Impending EDP Personnel Crisis

Result of an exhaustive year-long study, a recently released Bureau of the Budget Report on the Government's personnel problems in manning automatic data processing systems points to some large-size headaches just over the horizon. Substance of the report: In the next four years, Government ADP personnel problems are going to become prodigious if present personnel policies are followed. The report's conclusion: Unless solid, long-range planning is done now, the U.S. Government, biggest customer by far in the EDP field, will find itself the most poorly staffed. Here are the report's highlights . . .

by Harry H. Fite

Vice President and Washington Manager
Lester B. Knight & Associates, Inc.

IN THE spring of 1958, the Government's Inter-Agency Committee on Automatic Data Processing went to the Bureau of the Budget with a problem. In essence: Personnel problems of ADP (namely, job standards, selection and testing methods, means of combating turnover—indeed the true dimensions of the turnover problem—and training practices and needs) was a little known and largely neglected area of inquiry in the government.

BOB promptly launched through management consultants, Lester B. Knight & Associates, Inc., what turned out to be an exhaustive, year long study of the problem, issued a 156 page (plus 8 appendices) report late last month. Its finding: Government ADP personnel situation is not in good shape, is likely to get even worse unless something is done.

The study covered all government medium and large-scaled computer installations, whether used for business or scientific purposes, delved in both narrative and statistical fashion into the six primary ADP occupations: digital computer administrator, digital computer programmer, digital computer systems operator, management analyst (digital computer), peripheral equipment operator, and electronic technician (digital computer). Report also supplied data on associated occupations—primarily mathematicians, engineers, research scientists, supply officers, statisticians and accountants.

Because of the scope and depth of the report (it covers not only the immediate problems and their recommended solutions but also problems which have no easy solution and are likely to be with government ADP personnel for a long time) the report should have considerable reference value to ADP manpower and personnel administration for some time to come.

In Brief:

Six general conclusions are of sufficient moment to quote in full here.

1—The Federal Government will continue to be outbid on the labor market and will get little of the top competence emerging from the educational systems—even though the spread in entry level pay between government and business appears to be less than sometimes supposed.

2—Balance of flow of experienced ADP people will be out of the government rather than into it.

3—It will be progressively more difficult to recruit native competence from within. The same adverse recruitment pattern at the intake stage, which affects ADP, affects other government occupational groups as well—from which ADP personnel have been created in the past.

4—The problem will be more difficult to solve in relation to business applications than in scientific areas because:

a. traditionally scientists have found more appeal in government work than have management oriented people;

b. business applications are more difficult than scientific in the sense that a vast amount of detail has to be rationalized whereas in the scientific field ADP is becoming an adjunct of professional practice;

c. the recruitment squeeze will be particularly acute at entry because government will be in competition for a relatively small number of trained people. That is, while ADP will be offered in schools of business administration in the future, it is unlikely to be a popular subject.

5—Because all trends, particularly in the area of management and data processing uses, point to greater difficulties in developing effective applications, requirements for more sophistication and deeper grasp of management principles than ever before, success in the manpower field must be measured in qualitative terms rather than quantitative terms;

6—The measures needed to solve or even ameliorate the ADP manpower problem will never be undertaken unless much better mechanics for and much greater attention to long range manpower planning become available at a point of government-wide perspective and not departmentally.

There are over 4000 people engaged in the six primary ADP occupations alone today, representing an annual salary of some $27,000,000-plus. The report's predictions on the future are even more impressive. Among the statistics: payroll will mushroom to nearly $80-million by 1963, personnel strength to nearly 13,000. By the end of 1959, required ADP personnel strength is forecast to double over last year. Between 1959 and 1960, a 28% increase in personnel is projected with an additional 10% increase by 1961.

Noteworthy sidelights: Supervisory positions tend to cluster in the conservative civil service grades, there is no grave recruitment lag—at the moment, ADP positions in the defense establishment are filled primarily by civilians.

For the future: The report's prediction of growth pattern, occupation by

occupation, varies from that for the entire ADP population. Requirement for programmers increases some 83%, comparing 1958 to year-end 1959, climbs only another 20% during the following year. A 108% increase in systems operators needs is predicted by year end 1959, an additional 34% jump during 1960. Management analysts requirements in the same time frame: 125% and 23%. The report points out that these figures must be interpreted carefully—not just taken at face value.

However, one thing that does stand out is that total requirements represented by these projections are derived from reports from agencies already well into the computer field. It is very probable that other agencies, who, as far as this study is concerned, handed in a negative report or indicated no plans to adopt automation, will find opportunities to use computers—well within the period covered by these projections. Their needs could swell the projected manpower totals.

There are other possibilities. It is not unlikely, for example, that changes in workload in some agencies will make use of a computer a vital need. Said one leading government authority, "At the present time most of the applications are ones in which agencies have been pushed through sheer necessity. Other agencies may be similarly pushed." Furthermore, changes in the hardware itself may so change the techniques as to create additional applications. These circumstances all point to even greater manpower needs than those forecast. On the other side of the equation: have these forecasts been inflated? Possibly. The report points out that trends in equipment characteristics and methods of programming might simplify the programmer's (and to a lesser extent the operator's) job so that teams of the present size would no longer be required.

The ADP standards developed by the Civil Service Commission, the report found, are generally satisfactory and their mere existence a great benefit to personnel administration. There are two exceptions:

a. A nearly unanimous view that there should be different qualification requirements (more math) for programmers to work in scientific applications for programmers to work on business applications.

b. Requirements for specific experience in ADP for programmers and operators is introduced at too low a grade.

Job engineering was identified as a weak area. The number of different patterns on division of labor between programmers and operators on the one hand and analysts and programmers on the other appear excessive. Such rationalization would ease recruitment and testing and training and reduce friction among ADP staff members.

Recruitment Practices

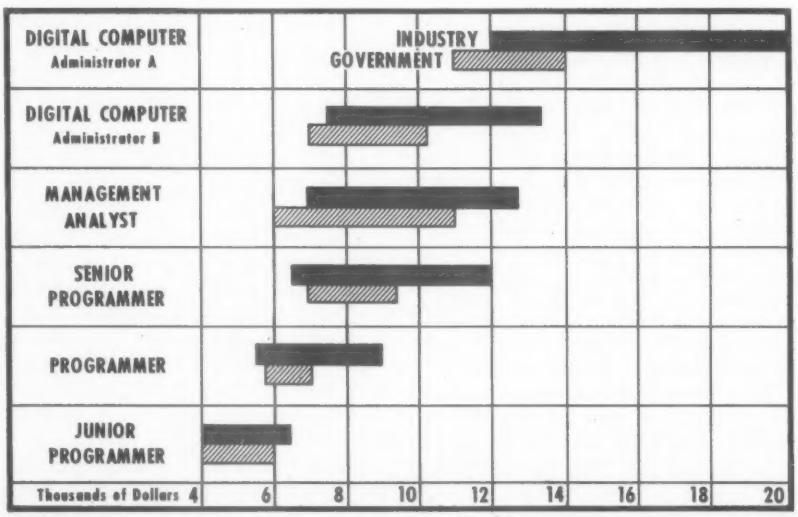
The point that stood out most prominently on this subject was the high variety in practices being followed from one agency to another. In some cases, the most systematic procedures were being used in rating of training and experience and in recording the results of personal interviews. In other cases, no rating forms were used for the first purpose nor was a written record made of interview results.

Great differences were also found in the use of written tests and the training period as a selection factor. Except for the use of the training period as a systematic selection device, a higher percentage of military than of civilian agencies make use of scientific selection devices.

Turnover was a subject of considerable interest at the outset of the study and data furnished by the agencies indicates it is too severe to be regarded with equanimity. Turnover—from the standpoint of the individual installation—was running at the rate of nearly 20% per annum. In a period of 15 months, 6% of the government ADP work force in the six principal ADP occupations was lost to private industry. The turnover from movement from one government agency to another, since it has been on a *laissez faire* basis up to now, is disruptive and serious. In the military establishment, the loss rate among personnel completing a required period of service is particularly serious, merits special attention.

For seven types of instruction listed, an input requirement is indicated of 14,000 in 1959, 13,700 in 1960 and 11,000 in 1961. The types of instruction: Appreciation Courses in ADP for Top Management, Training in Management Sciences, in Systems Analysis, Introduction to Programming, Training for Professional Programmers, Training in Computer Operation, Maintenance Training. On the supply side: balance can most nearly be struck in training programmers and operators because of aid available from manufacturers. In the areas of top management orientation, training of systems analysts, and training in management sciences, demand far exceeds supply. Only a few military bureaus have training resources commensurate with the projected needs. Not only is there a need for more training resources, but there is a real opportunity to improve courses in these fields. In some cases, training merely needs to be sharpened, while in others, the courses need to be materially augmented.

Clearly, "beefed-up" government facilities, necessary though these obviously will be, do not represent the best solution of the problem. Optimum use as well should be made of consultants, associations and service bureaus. However, it is the colleges and universities that will be needed to carry the major



As shown here, government salaries lag industry.

part of the extra government load.

Striking feature of the data developed by this study is that in the personnel sector, the adoption of ADP in the government has been characterized by free innovation and local initiative. Throughout the government, a wide variety of expedients have been used—in selection, testing, combating turnover and in training. As the report points out, "for the most part, these expedients seem to have worked out to the satisfaction of those who have employed them (but) whether this is because of their intrinsic rightness or because of the failure of the brokerage apparatus which would have made local users more aware of practice elsewhere, is one of the important questions raised by this inquiry."

Recommendations on Personnel Policies

1. The fact that the study revealed wide-spread difficulty in recruiting outstanding young people for the government was felt to be the matter of greatest urgency. This, together with the high rate of turnover of military personnel completing required military service, demonstrates a need to review government personnel policies.

2. Use of a "wage board" approach for setting salaries in the new and fluid field of ADP, to avoid rigidity and to assure that government ADP salaries are in line with the market rate was highly recommended.

3. Top management attention to the personnel aspects of ADP, was recommended to avoid any future "system frustrated" people or "people limited" systems.

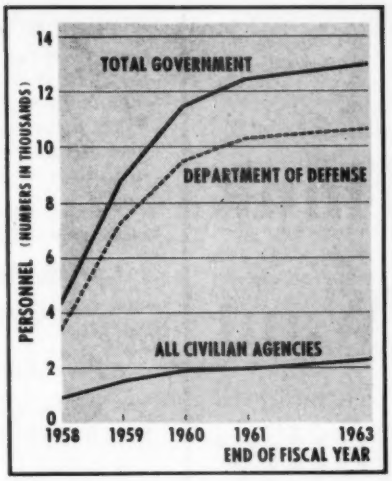
Job Standards

1. Recognizing that ADP is going through a shakedown period, provisions should be made for frequent re-appraisals of job standards, allocations of individual positions and pay scales, during this period of stabilization. To freeze these too soon could only prejudice the already adverse recruiting position.

2. The government should concentrate on improving the job breakdown among ADP occupations to reduce the number of combinations and patterns of occupational specialization and to make sure that there is a logical functional basis for each alternative finally determined upon.

Selection and Testing

1. It is recommended that standardization on the best approach developed to date in respect to interview records, methods of rating training and experience, and written tests be undertaken.



Future personnel requirements will continue to increase in the foreseeable future.

2. Standards for selection—test passing points, education and experience, background, performance level required during training—should be carefully reconsidered by an authoritative professional source.

3. It is recommended that recruitment—including decisions as to recruitment from "inside" versus recruitment from the "outside"—should be planned and guided on a bureau basis to assure a broad base for recruitment and the development of manpower on the basis of consideration of overall priorities.

4. Particular stress should be laid, in selecting personnel for key jobs such as systems analysis and creative programming, on high native aptitude, imagination and breadth of outlook rather than local considerations of convenience.

On Turnover

1. The cadre principle of forming a nucleus of a new organization from members of a number of older organizations has the two-fold advantage of getting a new unit off to a fast start and spreading the burden of loss among a number of old units. They should readily be able to adapt it to use in building up new civilian organizations as well. Greater and early adoption of this principle is recommended.

2. It should be possible to make use of the mangement "cadet" approach in government. Under this system, gifted junior personnel are trained in ADP techniques and used as members of task forces in connection with feasibility studies and new installations. This is recommended as a way of coping with the ADP pattern of greater need for manpower in the early years of an installation, and as a way of making the highest competence available to ADP at the time it is needed most.

3. As far as turnover is concerned, a major problem is government agencies competing with one another. Corrective action should include: (a) Elimination of disparities in pay and perquisites that make this possible; (b) Better planning and coordination of requirements and deployment of manpower in individual departments; (c) Action in flagrant cases by the Civil Service Commission to forestall raiding; (d) Use of the "cadre" principle in manning new installations.

On Training

1. The most acute problems revealed by this study lie in the area of training. The gravest of these lie in the gap between projected need for indoctrination of top management, training of ADP administrators and management analysts, and the currently-organized capability within the government for this purpose. Really extraordinary and bold measures need to be taken at once because, in addition to the large size of the requirement, the timing is urgent. Something equivalent to a domestic intra-governmental "technical cooperation" program is recommended. Such a program would have the following elements:

a. A top management to top management communication for purposes of indoctrination in the management principles and implications of ADP through a program of management seminars. It is believed that a group of assistant secretaries with experience in ADP would do a better job among a group of their counterparts who had not had such experience than would briefings by technicians. For personnel of this level, management perspective about the potentialities of ADP would be more meaningful than an exposition of installations and operating problems.

b. The urgency of this indoctrination process arises in part from knowing the right training sequence relative to any management or technological change in the adoption of ADP. Unless understanding at the management level is developed before technicians are trained and put to work, the application of the new development may be aborted.

In the case of ADP this has taken two forms. If untrained management takes too narrow a view of ADP potentialities, this leads to overly limited "machine substitution" applications. If, on the other hand, management is naively over-optimistic, its luster disillusionment can prejudice the success of the ADP program. To avoid these

(continued on page 48)

So You Think You Want A Computer

by Cdr. M. Vance Fowler
Executive Officer
NSD Newport, Newport, R.I.

The EDP business is an expensive one, and one that deserves careful thought. The suggestions set forth in this article will not insure a trouble-free installation of EDPM. No such blueprint exists. With a hope that pitfalls encountered by others may be passed, the following rules for EDPM installation are suggested:

- ***Insist on careful preliminary planning by top management's staff.***
- ***Select the machine to fit your application.***
- ***Select key personnel early—train them long and well.***
- ***Play down the savings aspect.***
- ***Insure that data are refined and purified before introduction to EDPM.***
- ***Schedule machine workload—a poor schedule is a big improvement over no schedule at all.***
- ***Provide a centralized information center to answer internal questions and coordinate problem solution.***
- ***Physical movement of material—Make it keep pace with the faster paper processing.***

WRITING in the Harvard Business Review Ralph F. Lewis emphasizes what he calls "the current status" of computer systems in business operations: "There is a fairly general feeling of frustration on the part of top management. Because the use of computers is not resulting in all the benefits anticipated, many members of top management feel that somehow either their employees or their suppliers have let them down."

The electronic computer as a tool of business is in its infancy. The first large scale electronic computer planned exclusively for business use was installed just over four years ago. The entire field is so new that a "computer expert" has been defined as "a man who hasn't had his computer delivered yet."

Speaking as one who has had his computer delivered I can attest that "experts" disappear rapidly when the machine arrives. Problems develop rapidly—solutions less quickly.

Those progressive individuals who are always looking for a better way to do the job have fallen over each other in their rush to get in on the computer bandwagon. Business Week reports that in early 1954, it was estimated that perhaps 50 companies in the country "could eventually use electronic brains." Yet by mid-1958 over 1,200 companies, plus units of the government and the armed forces had installed over 1,700 of them. Has an overselling job been done? In some instances, definitely yes. Let's take a look.

Ralph Lewis has indicated four real reasons why users have ordered electronic data processing equipment:

- **To keep up with the Joneses.**
- **To see what can be done with computers.**
- **To obtain identifiable cost savings.**
- **To obtain better or faster information.**

Although no one will ever admit that a machine was installed "to keep up with the Joneses," or to "remain modern" as some express it, this is all too frequently the real reason for a large number of computer installations. As may be imagined, such installations are usually made with much noise, endless claims, and inadequate preparation and planning.

The "experimental approach" is sometimes useful in the machine installation but is almost always quite costly. Perhaps the most useful application of this approach may be found in areas where free time may be found on computers already installed for other purposes.

The area of "cost savings" is perhaps the place where the greatest overselling job has been done. In all fairness to computer manufacturers, they have attempted to play down the cost-savings factor. To those at the lower echelons, who must sell the computer to higher management, the estimated cost saving too often becomes the only means through which they can get their idea across.

This fact is as true in the armed services as it is in private enterprise. During the period of justification for one armed services EDPM installation, a well-intended, highly cost-conscious defense official stated that he wasn't interested in efficiency and faster or better service. He was only interested in how much could be saved. Under such conditions, it's rather obvious that cost estimates are inflated way out of proportion by those convinced that they require a new EDPM.

Full consideration must be given to hidden and preliminary costs. The installation that doesn't run into unpredictable costs and delays is the exception. The rental or purchase price of the machine is only a part of the total cost. Such items as air conditioning, special floorings and wiring, feasibility studies, and training of personnel, represent sizeable investments ranging from a minimum of $50,000 to over $1,000,000 depending on size.

Cost savings will vary with each installation but should be approached with the utmost pessimism. Under any circumstances, direct cost savings rarely will occur during the first year of operation. Indeed for the first year or so, actual costs may be higher since both the old and new systems usually are in operation until the new system proves itself.

Here's where the computer vendors make their biggest

pitch. Electronic data processing machines give management not only more and better facts but produce them much more rapidly as well. In reluctant recognition of the volume and speed capacities of these new machines, a wag has suggested that EDPM means "Every Damn Problem Magnified." Another individual has come up with still another definition "Gigo" or "garbage in, garbage out."

Actually both of these definitions are not in themselves condemnation of EDPM. They are rather a full recognition of the fact that all computers are only as good as the information that is fed into them.

Few, if any, organizations now using EDPM have become familiar enough with this new tool of management to maximize on its promising potential. It took many years before anyone ran the four-minute mile. Now it's done with comparative regularity.

Likewise it will take a few years before we really know what we're doing with EDPM. Meanwhile the prospects for the future are exciting enough to stimulate even the most conservative.

Answering the question, "Will a Computer Really Pay Off?," Factory Management and Maintenance said, "The greatest of economy is in the optimization of . . . inventories, which more often than not means lower inventories and smaller capital investments."

Possessing accurate current inventory records makes it possible to know sooner when to re-order. Ultimately, EDPM, tied in with some form of rapid communication, will enable each Navy supply demand control post to receive an immediate report of world wide issues.

Recent experiments in transaction reporting by the Electronics Supply Office indicated that more current inventory information in the hands of the inventory manager results in a sizeable increase in supply effectiveness at the same time that dollar inventory investment decreases.

Being able to post each transaction as it occurs has long been a dream of inventory managers. The EDPM, particularly those of the random access type, helps make this dream approach reality. Not only can inventory investment be reduced but improved support can be provided as a result of less pipeline time, less paper-work, and faster issues of material.

Consider the current issue-processing time in the Navy. The objective of the Bureau of Supplies and Accounts is four days for a routine issue. Although endless statistics support the fact that this objective is being met, the simple fact is that we're fooling ourselves, but good. An objective study of the situation probably would indicae that our routine issue-time is at least twice as long as we claim.

What EDP Can Do

As a major customer of one of our major supply activities for a period of over two years, experience indicated that approximately two weeks was required for a routine issue. This was not the result of any lack of effort, knowledge, or desire on the part of the shore supply activity. They were simply victims of a paper system that has long outgrown its usefulness.

The advent of EDPM, with its capacity for both speed and accuracy, offers an opportunity not only to meet presently established issue goals, but to reestablish goals more in keeping with our modern, fast-moving Navy.

A four-hour issue-time for routine requests is well within the realm of capability. One large electric appliance manufacturer recently reported that prior to the installation of EDPM it took him four to five days to fill an order. Now he is able to fill on the same day any order arriving by 2 p.m. Many similar examples can be given. Reduction of issue processing time remains a real challenge for the Navy Supply System.

One of the most cogent reasons supporting EDPM is one seldom advanced. The recent Lebanon crisis will illustrate the point. Abnormal demands for material were received by the Naval Supply Depot, Newport, R.I., as soon as the emergency developed. In the 24-hour period following the start of the crisis, over 7,000 demands were processed and material delivered with relatively little effort. This represented approximately three to four normal days' demand.

By concentrating on issues alone, the EDPM was able to process paper which would have been, far beyond the physical capacity of human beings to process in such a short period even if you had the people. Thus EDPM possesses a latent capacity which is of vital importance to the immediate support of our fighting forces.

Problem Areas

Let's not get carried away with this thing too fast. What are the negative aspects of EDPM?

Error Correction—Promptness is essential but often difficult. Stock number changes, price changes, inventory adjustments and many other similar transactions occur constantly. Competition for programmer as well as machine-time becomes fierce. Frequently one essential job can be done only at the expense of another.

Inflexibility—EDPM lacks a basic capacity to change rapidly. Once programs are established, major changes become difficult because of the demands placed upon the time of both programmers and machine.

Scheduling—Must be tight for maximum machine utilization but if forced to remain loose in order to provide absolutely essential flexibility.

Application of Growth—Full provision must be made for growth. New stock items and additional applications require more space. This is a hard-to-predict area. How do we provide for new requirements? New machine? Drop old items off? A perplexing problem.

EAM vs. EDPM—Many experienced users say that transferring any already mechanized operation to electronic processing as a single self-contained operation is uneconomical. A representative of one of the leading equipment manufacturers recently was asked to explain the advantages of EDPM over EAM. An embarrassed silence was the only reply.

If you have a good EAM installation that you're satisfied with; if your inventory records are accurate; if you're making routine issues in less than one day, including peak demands—then you'd better stick with EAM. If not, EDPM consideration is in order.

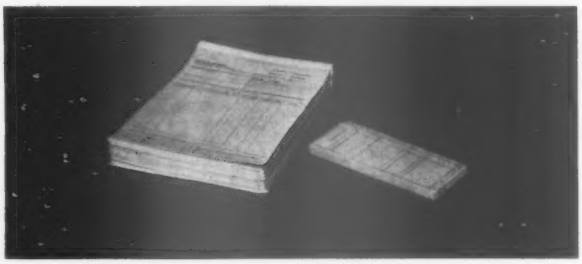
One serious problem in the Navy Supply System is emphasized by the advent of EDPM. Our normal operational communications system is not adequate. Except for the transceiver net used by the Aviation Supply Office all the communications equipment and techniques in use were developed many years ago. Circuit loads are limited. Speed and accuracy are not adequate.

The successful operation of an EDPM centered system must have a communications system designed to complement EDPM characteristics. These characteristics have imposed problems of transmission and relay of information that previously did not exist.

A system must be developed to combine teletype, punched card, magnetic tape and facsimile transmissions, all capable of transmission over one physical circuit in a completely accurate manner.

The Air Force has long recognized the seriousness of the logistics communication problem. Within two years, the Air Force Combat Logistics Net will be operational. This will be a world-wide automatic communications system of advanced electronic design. This system will transmit information from a number of input devices, including tele-

Cost Justifies the Planning...



29.8 Man-hours | 2 Man-hours

type, EDPM, or card transceivers.

An interesting discussion on this subject recently appeared in ARMED FORCES MANAGEMENT. This article concluded that the new communications net would provide a means for integrating all information needed to operate and manage the Air Force materiel system.

It will provide a logistics system with quick reaction time thereby reducing pipeline time, eliminating costly stockpiling, and at the same time providing the operational forces with timely adequate support. The Navy has no such logistics communications net, a fact worthy of considerable study.

It is not the intention of this paper to prove the inadequacy of the Navy communications system as a tool of logistics support. It is intended to point out, however, the maximum benefits of EDPM cannot be fully realized with our present communications system. This may be a factor for consideration in any EDPM investment.

Where does all this leave us? Surely we have seen that the introduction of EDPM into any organization is not a matter to be taken lightly. We have seen that we're dealing with a most perplexing and disgruntled revolution. It's disgruntling because the fancy dreams and wild claims simply have not panned out.

Especially is this true in the area of monetary savings. We also realize that we don't solve a complex problem simply by purchasing an electronic "brain." These "brains" are smart but man must give them accurate facts to think with. All of this is most discouraging. Where do we turn? There's no easy answer.

We have become ensnarled in so much paperwork that our clerical labor force considerably outnumbers the productive force. Yet our inventory control is neither timely nor completely accurate.

One endowed with the enthusiastic approach frequently becomes so engrossed in the advantages of the equipment that problem areas are greatly underestimated or neglected entirely. Here are a few suggestions that may be of some value.

Plan Ahead

Experienced travelers long ago learned that a well defined course makes the journey much easier, more enjoyable and more successful. Indeed without the proper charts, sometimes you don't get there at all. This principle is equally applicable to the installation of EDPM.

The proven path to success in applying computers to inventory control problems is to make a complete analysis of what is desired from the machine and how it can be obtained in detail before accepting delivery. This study is a top management problem. It should be made by top management's staff. The study is a difficult task involving many man-years of preliminary investigation, detailed programming, testing and re-programming.

A complete review of management problems is necessary if facts produced for management are to show improvement. A machine does a pretty good job calculating but it can't do the planning. EDPM is a workhorse if controlled, a mean monster if uncontrolled.

A portion of the planning study should be devoted to the area of organization. Visualizing the possibility of a total computer system as opposed to a single application, it is all the more important that the computer not be superimposed on the old organization. A complete re-organization may become necessary.

As Lionel E. Griffith has so ably expressed it, "We are now required to think of organization as a totality and not as an expression of special areas . . . The new area of machine data processing has not been assessed in its proper proportions. It has not been recognized as being the center of a series of systems which can allow for complete accounting, statistical, production, marketing, and management control."

Machine Selection

Closely related to the planning area is the matter of machine selection. Equipment manufacturers are no longer operating in the seller's market they once occupied. International Business Machines, Remington-Rand and Burroughs are old hands at the business. Other well established entrants into the field include Minneapolis-Honeywell, National Cash Register, Philco, Radio Corporation of America, and many others.

Business has been so good for so long that some of the manufacturers have become somewhat complacent. Others are extremely "hungry" for new business. Recognizing the principles of supply and demand, any naval activity anticipating EDPM installation is in a position to drive some hard bargains—not bargains as to price for that is fixed—but bargains as to machine adaption to requirements and, also in the area of service.

A good plan becomes one of deciding the applications required and then permit the vendors to show how they can meet your requirements. A machine which can do a large number of things for which you have no requirement is just so much extra equipment.

Some manufacturers are willing to modify their machines to meet your requirements. Purchases based on old habits alone may prove disappointing. Take a good look and place your order intelligently. Don't be tied down by a machine or system that will not fit in with your long-range plans.

It's important if you can achieve savings, but don't be too optimistic. Don't commit yourself for savings you may well realize. It's much better to underestimate than overestimate. Intangible savings may greatly exceed the tangible variety, but they're much harder to determine, near impossible to prove. Let caution be your guide. You'll probably be able to do the job less expensively, but tell about it after you've done it, not before.

The installation of EDPM provides an excellent stimulus to improving the physical movement of material. The expected increase in the speed and accuracy of paper processing becomes somewhat lost if the physical handling of material does not keep pace. Popularity stowage of stock, conveyorized warehouses, and direct local delivery from warehouses have all speeded up the movement of material at NSD Newport.

Material which was formerly picked at the rate of eight items an hour is now picked four to five times faster with less effort exerted. Most of these improvements could have been implemented without EDPM, but the fact remains that EDPM supplied the stimulus—the friendly competition.

Article furnished courtesy
Monthly Newsletter of the Navy Supply Corps

How PERT Predicts for the Navy

Special Projects Office Chief RAdm. W. F. Raborn firmly believes management advances must keep up with the pace set by technology. This is one way that it is being done . . .

by Fred Hamlin

WHEN the men in Navy's Special Projects were some nine months down the road on developing their Program Evaluation Review Technique (PERT) project, they were visited by a team of top-level executives from one of the nation's most respected industrial research organizations.

After a preliminary rundown on the PERT system, the industry consultants were shaking their heads sadly. The reason, in their own words: "You people have done here something that we've been trying to do for nearly four years. Needless to say, we feel you have a pretty fine program."

What PERT does: (1) states the sequence of progress bench marks in a given program as they must occur under current planning to achieve success. (2) Measures the relative uncertainty—based on technicians' estimates —of meeting these benchmarks, and as a result, of program completion. (3) Combines network and time data to show their joint impact on program completion.

(4) Reveals critical areas and slack areas—those which are either ahead or behind schedule, or those which are likely to be. (5) Computes current probability of meeting all completion dates by comparing probabilities and deadlines. (6) Tailors outputs to all appropriate levels of management technical responsibility. (7) Simulates time impact of proposals for change and optional courses for remedial decision on the outlook of final deadlines.

Willard Fazar, one of the originators of PERT, and presently in charge of PERT at Special projects, adds one other advantage, and a bit of prediction: "Perhaps most important, PERT forces customer and contractor to maintain the sort of communications that everybody always assumed to be there. Beyond that, we haven't yet begun to imagine all of the advantages that PERT will eventually offer."

In short, PERT analyzes the current validity of approved plans and schedules, the progress to date against program objectives, and the outlook for meeting ultimate objectives on time—without further executive action.

According to Willard Fazar, "PERT is a management control tool for defining and integrating what must be done to accomplish program objectives on time. PERT is a statistical technique —diagnostic and prognostic—for quantifying knowledge about the uncertainties faced in completing intellectual and physical activities needed for timely achievement of program deadlines. It is a technique for focusing management attention on danger signals that require remedial decisions and on areas of effort for which tradeoffs in time, resources or technical performance might improve capacity to meet major program deadlines."

Put simply, PERT is a consolation of probabilities to evaluate past performance. It can be used on this basis to predict future success. Its major use is necessarily with a program with a size approaching that of the Polaris Fleet Ballistic Missile. That is, a program that is too complex to be evaluated by ordinary means. Using a medium to large digital computer (IBM 650/705), PERT consolidates all of the information funnelled into Special Projects on Polaris progress, puts it in perspective and context, and comes up with what amounts to a highly educated guess—based on statistical probabilities—on exactly who in the program is behind, ahead of or on schedule. The obvious corollary is PERT's ability to show management where it can best manage by exception. Trouble areas are neatly spotted, and those areas ahead of schedule can be left to go their own way. At the same time management is given the option of transferring funds or manpower from parts of the total that are ahead to those behind.

Oversimplified, PERT reports by showing about the same thing on its flow charts as a tournament sheet in a golf match, displaying the various flights as they narrow down to the finals. Those golfers who draw byes spend less time playing golf, and those scheduled for every flight will have to spend more time on the course. The difference here is that PERT is not concerned with who wins the tournament—what PERT wants to know is how soon the tournament will be completed, and how, by readjusting the byes they can get it over with sooner.

The common denominator is time. Formerly attempts at this sort of system were set up in terms of funding or technical performance. But in the Polaris program, it has been accepted that money will be spent to buy time. Because money is not as tight here as it is in some areas, it follows that technical performance can be brought in more or less as needed. Money and performance then, are the variables, and are only important—for PERT's purposes—insofar as they contribute to the time factor.

As an important sidelight, the PERT system allows any contractor—or the Navy—to run test cases on alternatives to an existing program, again with the aim of cutting the time needed to complete a project or a major sub-part of the project. By using this techniques, one Polaris contractor who had found himself lagging considerably behind schedule was able to find where the trouble was, and eliminated two-thirds of the time beyond deadline he had thought he needed. Footnote: the same contractor is still working with PERT to get himself all the way back on schedule.

This is how PERT works. First, the PERT office at Special Projects sets up a sequence of events, or milestones, which will lead to the completion of a given system or subsystem. This is drawn up in reverse order, moving from end product to the present status of the given project. This chart is then farmed out to the contractors or agencies working on the various parts of the whole, and the scientists and engineers in charge return the charts with their time estimate on completion dates. They give Special Projects three estimates: (1) most likely completion date, (2) most optimistic date, given an

unexpected breakthrough in state-of-the-art or similar step up, and (3) most pessimistic date, assuming practically nothing goes right.

These figures are edited for reasonableness at Special Projects, and then programmed into Navy's NORC computer at Dahlgren, Va. The computer averages out the figures, and gives a printout that is used to formulate the PERT flow charts. The charts are the end product of PERT. They show not only the relation between the various parts of the whole in point of time, but how long it will probably take from each milestone to the next.

Given this much, the charts also show which of the flow lines is most critical—that is, which is most likely to take the longest time to be completed. It is the old story of the chain being as strong as its weakest link. If, for instance, the most critical line is some three months longer than its nearest competitor, Navy immediately knows that it can shorten the entire program by three months, simply through attacking that one area. Further, if one milestone in that line is three months beyond the one before it, Navy knows that it can gain most of its time back by going after that one part of the line.

And once Navy has eliminated the one problem area, the PERT chart still shows the next most critical line, giving Navy its next area of operations for further cutting the time needed to complete the project.

One of the criticisms most frequently levelled at PERT points up the basic theory behind the system. Say PERT critics, "If you put garbage in a computer, you get garbage back. The PERT system relies on an engineer's guess about when his part of a project will be done. Because you are dealing at the edge of present technology, it is nearly impossible to make an accurate guess on progress. Inaccurate guesses mean inaccurate results, and so about all you get is unreliable information compounded."

Not so, say the people who work with PERT. The theory behind the system is roughly the same as that used by social scientists—that of statistical probabilities. Oversimplified, this theory states that a large number of educated guesses on a given subject will average out to an answer that is close to being entirely accurate. Perhaps more important, when all such figures are averaged out, they will point up a trend that can be largely relied upon.

From management's standpoint, this trend is extremely valuable. Without it, they are literally shooting in the dark, with nothing but occasional blind stabs to guide them. Besides this, the man who screams the loudest may not always have the biggest problem—one of the most important functions of PERT is to make progress analysis as objective as possible, thereby putting all of the many factors to be considered in context and perspective.

Considering the job that is handled by PERT, the amount of time and money that has gone into it has been almost negligible. Aside from the initial study contract, the returns on PERT have far overbalanced the investment. Once the theory was set up, it took PERT managers only about half a day at each of the various Navy and Contractor offices to indoctrinate personnel concerned. As for the time needed to feed information to PERT.

"The engineers and scientists that I've talked to feel that the time they spend on this is profitable time. I suppose this is probably because it gives them a chance to evaluate their own position fully, and take a good look at where they stand."

The Cost is Low

With the system now in operation, there are only five professional people at Special Projects working full time on PERT. Computer time runs less than an hour a week, and costs less than $200 per hour. It takes between fifteen and twenty minutes for a PERT network to be run through the NORC computer once it is programmed.

Actual computer sequence on the information is as follows: (1) input conversion, about an hour; (2) mean and varience computation, about one minute, using NORC; (3) sort and merge runs, about five minutes using NORC; (4) file updating, about three minutes, using NORC; (5) sequencing, about five minutes, using NORC; (6) computation, about three minutes, using NORC, and (7) edit and printout, about 36 minutes.

From the printout, the information must be interpreted by PERT technicians and transposed to the flow charts that are used to present the finished product. To date, PERT has set up the flow charts on at least half of the Fleet Ballistic Missile program.

PERT's most important job at the present time is to answer one question, as it is posed each Monday morning by Special Projects Chief RAdm. W. F. Raborn: "What are my problems?" All of the information that is turned into PERT eventually ends up on the PERT flow charts, which are given to RAdm. Raborn bi-weekly. They answer the question.

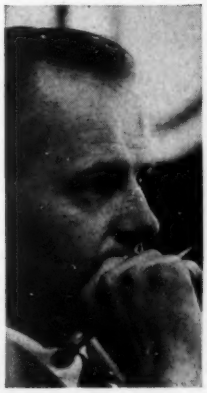
Besides this, PERT can be used equally well by all levels of management. While Adm. Raborn is most interested in the overall Fleet Ballistic Missile program, each of the major contractors can draw on PERT to fit their specific evaluation needs. Using the system in the same way, contractors and even important subcontractors are using the PERT method to find out where they stand—and to find out where they can most profitably make improvements in their own operation. Flow charts on major subsystems can be as large as the wall of a room, and the sizes—and the material contained—can be tailored to fit just about everybody's needs.

Another measure of the success of the system is related by Willard Fazar: "There is one other thing about this that makes the scientists extremely happy—it is just about the first time that management has acknowledged the uncertainty of research and development work. Before this, management was perhaps too prone to set a deadline, and say 'You have three months to invent something—get to work.' PERT was developed on the assumption that research is a pretty uncertain business. What we try to do is to balance out all of the factors—from hurricanes to breakthroughs—and come up with a reasonable expectation."

Although PERT to date has not been highly publicized, a measure of its worth is the amount of interest that has been generated already. Flowing into the Special Projects office have been a list of requests that covers six typewritten pages—and already, PERT officers are pencilling other names in between the lines. The requests have come from all three services, all manner of industries, foreign and local state governments, and even such improbable sources as state census bureaus.

These queries are not idle curiosity—many of the organizations have already begun to apply the theories of PERT to their own operations, and still more have enthusiastically endorsed the program. What it means is that Navy's Special Projects office has hit a good thing, and something is needed in many places. It is as simple as this: everybody wants to know what is going on in their own operation, and PERT appears to offer one of the best methods to date to keep close tabs.

WASP



THESE MEN DO ALMOST NOTHING BUT THINK

Unique new group helps Westinghouse anticipate and plan for future military needs

It's harder than ever to stay out front in defense.

Weapons systems are now fantastically complex. New innovations—like thermoelectricity and molecular electronics—threaten to make key subsystems obsolete overnight. New developments may suddenly reduce the tactical usefulness of a U. S. weapons system.

Westinghouse, like many other firms, has been concerned about how to meet this problem—and how to organize its many R&D and manufacturing operations to more effectively support America's increasingly complex defense needs. It seemed that the organization which had worked fine in the past simply wasn't adequate for anticipated future demands.

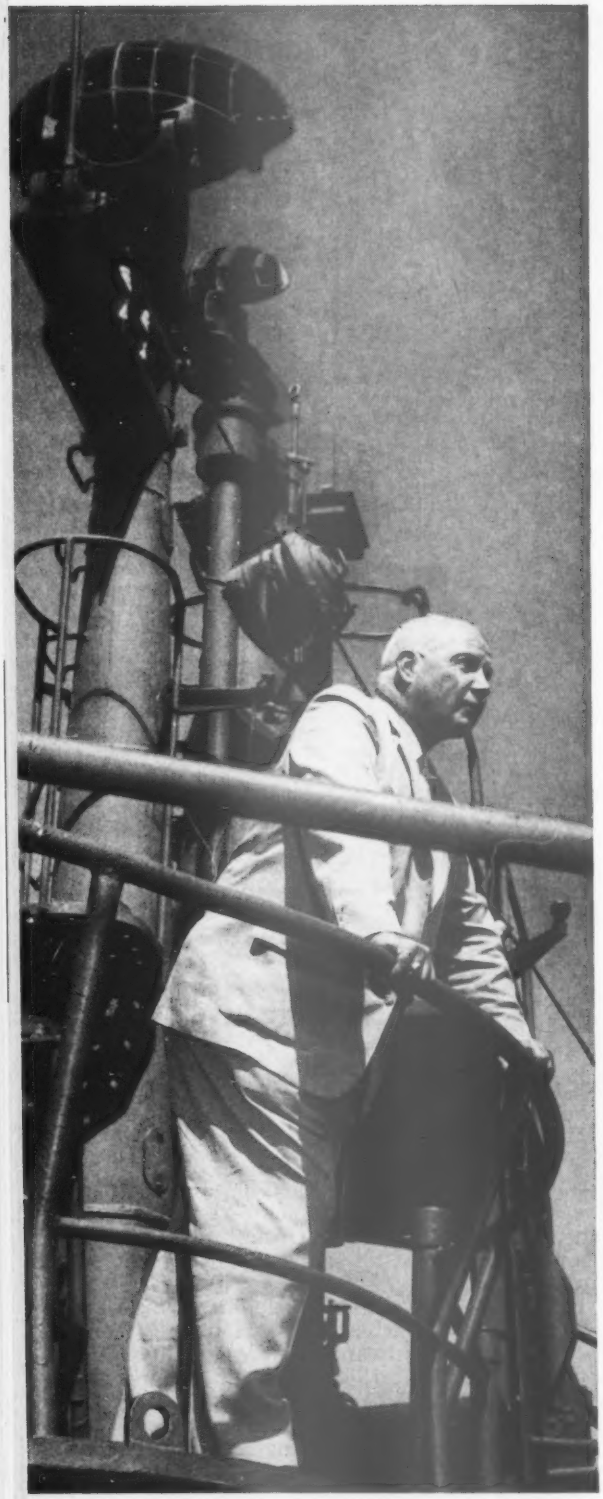
So things were completely reorganized in February, 1958. A new Defense Products Group was established, centralizing control of all defense-oriented activities within the company.

But a most interesting—and promising—part of this new organization, the new Westinghouse Advanced Systems Planning Group (now commonly called WASP), wasn't announced publicly until August.

This was a significant development. Since technology is moving faster than ever before, there's a real need to effectively anticipate what will be needed in 5 or 10 years. If this can be done, longer-lived defense systems can be developed more quickly and substantial sums can be saved. WASP should be able to provide the advance thinking needed by Westinghouse to meet this need.

Staffed with hand-picked engineers and scientists—specialists in electronics, outer space, atomic power, ASW, operations research, etc.—and headed by Allan Chilton (top center photo above), WASP operates on a unique charter: to concern itself primarily with

CONTINUED



MATCHING NAVAL REQUIREMENTS with Westinghouse capabilities, Leonard Dow, a professional career specialist in naval strategy, tactics, and weapons systems, is associating advanced technology to future naval systems.

"The idea is sound, but how can we keep it from burning up? Present insulations won't work. How about ablative heat sinks? No—they won't work either in this case."

complete advanced weapons systems, to deal with the "whole" instead of "parts".

This is not just a "blue-sky thinking" assignment. Westinghouse believes future defense needs will be so complex that only a full-time team of specialists—like WASP—will be capable of the kind of conceptual planning and guidance needed.

There's another reason why defense planners will be interested in WASP. This new group gives them a single point of contact within one of America's largest and most versatile industrial firms to which they can take immediate and long-range defense problems. No longer will it be necessary for someone

"... son, it circles the earth at 18,000 miles an hour." Space consultant, K. Satyendra, a Ph.D. from India, keeps WASP and other company scientists abreast of space needs. He is an authority in mission, trajectory, and communication concepts.

TOP ENGINEER AT WASP, Rein Kroon joined Westinghouse in 1931. Among other accomplishments, he headed the engineering group responsible for the design of the first American turbojet engine for aircraft.

"What's the best way to destroy an enemy reconnaissance satellite? Attack it from earth? Or from another satellite? How would we go about either method?"

to try to guess which Westinghouse division is best equipped to tackle a given job.

This is a bigger advantage than might be apparent. A newly-published capabilities chart*, for example, lists 29 different Westinghouse facilities and, for each, indicates specific study, design, or manufacturing capabilities in 33 different areas (infra-red, rocket powerplants, torpedoes, missile base equipment, etc.). This same chart lists 16 Westinghouse facilities which can handle system analysis and 7 capable of complete system management.

**Available to qualified individuals and firms upon request.*

"Could we deflect enemy ICBM's by sending them false signals at the time of launching? If so, could this be done from distant transmitters? Could this be done automatically from remote un-manned stations?"

MAN ON THE MOVE, Bill Robinson has his sights on tomorrow's systems and provides guidance for WASP in planning for future Department of Defense needs.

Westinghouse

DEFENSE PRODUCTS

1000 CONNECTICUT AVE., NW, WASHINGTON 6, D.C.

YOU CAN BE SURE... IF IT'S Westinghouse

Comparison of Maj Co

Model	Manufacturer	Appli-cations	Numerical System	Input	Memory	Output	Power reqmnt.	Sq. Ft. Area rqmnt.	Cost in $1000	Rental per mo.	Production record P	Production record O	Reli-ability
Punched Card Calculators and Computer Systems													
604	International Business Machines	C-S	bin coded dec	Cr-PC	ET-R	Cr-PC	7.59 KVA	19.4	26	550	–	–	10ST
607	International Business Machines	C-S	bin coded dec	Cr-PC	ET-R	Cr-PC	13.5	36.5	37.5	800	–	–	–
UNIVAC 60	Remington Rand	C-S	bin coded dec	PC	VT	PC	10	43	75	740-1015	–	–	–
UNIVAC 120	Remington Rand	C-S	bin coded dec	PC	VT	PC	10	43	97.5	1075-1350	–	–	–
Large Size Computer Systems													
DATAmatic 1000	DATAmatic Div., Minneapolis-Honeywell Regulator Co.	C-S	bin coded dec, coded An	PC-PT-K-MT	MC-MT	PC-Pr-Pat-MT	110	550	985	21,500	7	7	0.95
704	International Business Machines	E-C-S	binary	PC-MT	MC-MD-MT	MT-PC-Pr-CRT	96.4 KVA	1350	1109	24,450	–	–	0.98
705	International Business Machines	C	bin coded, bin, al	PC-MT	MC-MD-MT	MT-PC-Pr	97	2500	1500	26,000	–	–	0.95
709	International Business Machines	E-C-S	binary	PC-MT	MC-MD-MT	MT-PC-Pr-CRT	130	2000	2484	34,700	–	–	0.95
7070 (card, tape, RAMAC, RAMAC tape)-Tr	International Business Machines	E-C-S	decimal	PC-MT	MC-MT-Disc-RAMAC	PC-MT-Pr	35	950	547	12,000	–	–	–
7090-Tr	International Business Machines	E-C-S	binary	PC-MT	MC-MT	PC-MT-Pr	40	1100	2,590	58,300	–	–	–
NCR 304	National Cash Register Co.	GP	bin coded dec, al	MT-PC-PT-K	MT-MC	MT-PT-PC-K-HiSp	20	1500	850	18,900	–	–	–
LARC-Tr	Remington Rand	GP	bin coded dec	PC-MT-K	MC-MD	PC-MT-HiSp	self-contained	2000	–	–	–	–	–
UNIVAC I	Remington Rand	GP	bin coded dec	MT-K-Pat-PC	Memory-DL	MT-PC-Pat-HiSp	124.5	2500	1279	23,000	–	–	0.93
UNIVAC II	Remington Rand	GP	bin coded dec	MT-K-Pat-PC	MC	MT-Pat-PC-HiSp	143.9	2500	1521	28,000	–	–	0.93
TRANSAC S 2000	Philco Corp.	GP-DR-E-C-S	binary	PC-PT-MT-F	MC-MD	MT-HiSp-PC-PT-F	24	800	1500	30,000	15	2	–
PERSEUS	Ferranti, Ltd.	C	binary	MT-PT	ADL	Pr-PT-MT	60 KVA[5]	1106	400	–	2	–	–
M-460	Remington Rand	S-DR	binary	Pat-MT-PC-AD[6]	MC-MD	Pat-MT-PC-DA[7]	1.2	27	750	–	–	–	–
1103A	Remington Rand	S-DR	binary	Pat-PC-MT-AD	MC-MD	Pat-MT-PC-HiSp-DA	100	1560	1500	30,000	–	–	–
1105	Remington Rand	GP	binary	MT-PC-Pat-AD	MC-MD	MT-Pat-PC-HiSp-DA	170	2000	2172	44,870	–	–	–
MOBIDIC-Tr	Sylvania Electric Products	GP-E-S[5]	binary	F-K-PT-PC-Ty-MT	MC-MT	HiSp-Pat-PC-MT-F[11]	–	800	–	–	4 in production		
GE-150	General Electric Co.	DP	bin coded dec	MChR-MT-PaT-F-CR	MC-MT	Pr-MT	22KW	2000	800	24,000	3	2	0.98
Medium Size Computer Systems													
ALWAC IIIE	Alwac Computer Div., El-Tronics, Inc.	GP	binary	PC-PT-MT-F	MD	PC-PT-MT-F	8 KW	28	77	2585	37	37	0.975
H800	DATAmatic Div., Minneapolis-Honeywell	E-C-S	bin coded dec, coded An, binary	MT-Cr-Pat-K	MC-MT-MD	Ty-HiSp-Pr-PC-Pat-MT	25 KVA	850	550	11,000-18,500	–	–	–
205	Electro Data Div., Burroughs Corp.	GP	bin coded dec	PC-PT K-MT	MD-MT	Ty-PT-MT-PC	21 KVA	400	135	3900	–	–	0.975
220	Electro Data Div., Burroughs Corp.	GP	bin coded dec	PC-PT-K-MT	MC-MT	Ty-PT-MT-PC-HiSp	30 KW	540	320	7800	–	–	0.982
G15	Bendix Aviation Corp.	GP-S-DP-DR	binary	PC-PT MT-K	MD	PC-PT-MT-Ty-Plotter	3.8 KVA	60	49.5	1485	230	220	0.98
Mark I	Ferranti, Ltd.	S	binary	PT	MD-CRT	Pr-PT	26 KW	600	400	–	9	8	0.97
Mercury	Ferranti, Ltd.	S	binary	PT-MT	MC-MD	PT-Pr-MT	40 KVA	36	400	–	10	8	–
Pegasus	Ferranti, Ltd.	S	binary	PT-MT	MD-ADL	PT-Pr-MT	12 KW	60	200	–	25	20	0.98
650 (card)	International Business Machines	E-C-S	decimal	PC-PT	MD	PC-Pr	17.7 KVA	250	182	3750	–	–	0.95
650 (tape)	International Business Machines	E-C-S	decimal	PC-MT-PT	MD-MC-MT	PC-MT-Pr	50	1000-1200	356	7500	–	–	0.90
RAMAC 650	International Business Machines	DP	decimal	PC-PT	MD-MC-Disc	PC-Pr	50	1000-1200	374	7300	–	–	0.90
RAMAC 650 (tape)	International Business Machines	E-C-S	decimal	PC-PT-MT	MC-MD-MT-RAMAC (Disc)	PC-MT-Pr	60	1800	432	8750	–	–	0.90
RAMAC 305	International Business Machines	DP	bin coded dec, al	PC-PT	MC-MD-Disc	PC-Pr-Ty	16	400	190	3250	–	–	0.90
Libratrol 500	Librascope, Inc.	C-E-S	binary	Ty-K-Pat switches	MD	Ty-PT-relays	–	1980	85	–	1	0	0.98
Monrobot V	Monroe Calculating Machine Co.	note #7	bin coded dec	K-Pat	MD	F-Pat	5KW	Desk	86	–	1	1	0.85
Monrobot VI	Monroe Calculating Machine Co.	S	bin coded dec	K-PT	MD	Pr-Pat	–	40	95	–	9	9	0.95
102A READIX	J. B. Rea Co., Inc.	E-C	bin coded dec	F-PC-MT	MD-MT	F-PC-MT	–	–	65	3240	5	3	0.90
UFC 0	Remington Rand	C	bin coded dec	MT-PC-K-Pat-Special	MD	MT-PC-Pat-HiSp-Special	12	1000	300	7000	–	–	–
UFC I	Remington Rand	C	bin coded dec	MT-PC-K-Pat-Special	MC-MD	MT-PC-Pat-HiSp-Special	20	1000	500	12,500	–	–	–

Computer Systems

Model	Manufacturer	Appli-cations	Numerical System	Input	Memory	Output	Power reqmnt.	Sq. Ft. Area reqmnt.	Cost in $1000	Rental per mo.	Production record P	Production record O	Reli-ability
USS 90	Remington Rand	GP	bin coded dec	PC	MD	PC-HiSp	14.4	530	347.5	6950	–	–	–
USS 80	Remington Rand	GP	bin coded dec	PC	MD	PC-HiSp	14.4	530	347.5	6950	–	–	–
GE-210	General Electric Co.	DP	bin coded dec	MChR-MT-PaT-F-CR	MC-MD-MT	Pr-MT	12KW	1200	400	12,000	5	4	0.98
Small Size Computer Systems													
FADAC	Autonetics Div., North American Aviation	GP-GS-E	binary	Pat-K-MT-FADAC[12/]	Disc	PT-Ty-MT Nixie Tube-FADAC	Fully Tr	5.3	–	–	4 under production		
RECOMP II	Autonetics Div., North American Aviation	GP-S-E	binary	PAT-K-Ty	Disc	PT-Ty Nixie Tube	Fully Tr	2.7	86	3000	20	20	0.97
JUKEBOX	Autonetics Div., North American Aviation	GP-GS-E	binary	K-Pat	Disc	Ty-Nixie Tube	Fully Tr	2.2	–	–	20 under construction 4	3	–
E101	Burroughs Corp.	C-S	pulse coded dec	K-PC-PT	PT-MD	Pr-PT	3 KW	Desk	25.55	1000	5 under construction –	–	0.96
610	International Business Machines	E-S	decimal	K-PT	MD-PT	PT-Ty	1.8 KVA	Desk	55	1150	–	–	0.90
LGP-30	Librascope, Inc.	C-S	binary	Ty-PT-Pat	MD	PT-Pr	1.5 KW	8	39.6	1100	260	260	0.93
Monrobot IX	Monroe Calculating Machine Co.	C	binary	Ty	MD	Ty	0.6 KW	Desk	9650	–	25	–	40 hrs. Avg. error free running time
LGP-30	Royal McBee Corp.	GP	binary	K-PT-PC	MD	PT-F-PC	1.5 KW	8	43.5	1100	280	270	0.95
Model 100	Underwood Corp.	C	decimal	K-PT	MD	PT-Pr	–	25	32.5	925	–	–	–
Special Purpose, Experimental, etc.[10/]													
IAS	Institute for Advanced Study[4/]	S	binary	PC	CRT-MD	PC	20 KW	22	500	–	1	1	0.70
Leprechaun	Western Electric	computer research	binary	PT-K	MC	PT-Ty	0.160 KW	16 cu. ft.	–	–	1 under test		
RASTAC	Laboratory for Electronics	aux. storage	decimal	MT-PAT-K-computer output	MD	MT-Pat-Pr	10-30 KW	250	175	–	1	1	100 hrs. Avg. running time
Monrobot MU	Monroe Calculating Machine Co.	note #8	bin coded dec and sexadec	K-Pat-MT	MD-MT	F-Pat-Mt-TT28	–	500	800	–	1	1	–
RASTAD	Laboratory for Electronics	aux. storage & display	decimal	MT-Pat-K computer output	MD	CRT	32	275	300	–	1	–	–
ATC (air traffic control) data processor	Librascope, Inc.	GP-mil. surveil.	alpha-numeric	Pat-TT28-Ty	MC-Drum file	Ty-F-display	90 (entire 4 comp. system)	160 (entire system)	–	–	1	1	–
Lincoln TX 0	Mass. Inst. of Technology	computer research	binary	Tog switch F-Photo Reader	MC-Tog Switch	F-CRT	10 KW	200	–	–	1 under test		
MANIAC II	U. of California	physical research	binary	PT-MT-K	CRT-MT	Ty-PT-Pr	25 KW	98	225	–	1 under construction		
GE-312	General Electric Co.	E-S	binary	F-PaT-Analog-Sca	MD	F-Pt	4 KW	18	80	–	8	6	–

NOTES: Because of the confusion which surrounds access time and speeds, which are not standardized, they have been omitted.
1/ power requirement and area requirements, where given are for basic computer system only; do not include air conditioning units, and the like.
2/ cost and rental figures are for basic computer system only and are only approximations.
3/ reliability figures are based on experience of military users only where significant facts available; where not, reliability is based on an average of all users.
4/ design and development provided basis for many other systems of its kind such as AVIDAC, GEORGE, TRANSAC S 1000 and 2000.
5/ Includes refrigeration
6/ On-line analog to digital converters
7/ On-line digital to analog converters
8/ Designed for use in solving computing problems normally encountered by topographic troops in survey operations.
9/ Used for item inventory and monetary accounting
10/ Computers listed here are only a representative sampling of the several score machines which have been built, primarily in quantities of one or two by, mainly universities or the Services themselves to serve a special purpose.
11/ Up to 63 input-output devices including disc memory and teletype terminals.
12/ FADAC outputs to and accepts input from another FADAC directly.

KEY:

C–commercial
E–engineering
GP–general purpose
GS–general scientific
S–scientific
DR–data reduction
DP–data processing
ADL–acoustic delay line
Al–alphabetical
An–alphanumeric
MchR – Magnetic character reader
Ax–approximately
Bin–binary
Cr–card reader
CRT–cathode ray tube
Dec–decimal
ET–electronic tubes
F–flexowriter
HiSp–high speed printer
K–keyboard
MC–magnetic core
MD–magnetic drum
MT–magnetic tape
MW–magnetic wire
O–operating
P–produced
Pat–paper tape
PC–punched cards
Pr–printer
PT–punched tape
R–relays
Sca–raw data scanner
SD–sonic delay line
ST–Avg. Service time per month
Tr–transistor
TT28–Teletype Model 28
Ty–electric typewriter
V–various
VT–vacuum tubes
–info is not available, or based on available info no accurate comparisons can be given.

ARMED FORCES MANAGEMENT
July, 1959

THE *National** 304

The United States Marine Corps has selected, and will install, three National Electronic Data Processing Systems for Personnel Accounting

USMC considers Personnel Accounting far more complex than a routine paper-handling job. To assure efficient personnel control, it requires a system with extraordinary capabilities. The National 304 is such a system.

The Magnetic Tape System transfers data at 30,000 characters a second . . . provides variable length recording with no inter-record gaps . . . contains a built-in program to simplify file management.

High-Speed Input-Output Units read 1500 cards a minute . . . 1800 paper tape characters a second . . . and prints at the rate of 600 lines a minute. The 304 provides a high-speed balanced system for personnel accounting.

Economy of Operation is obtained through printed circuits, transistors, and magnetic core memory. This "solid state" design requires less power, less air conditioning, and less floor space.

Individual Packaged Components assure the Marine Corps of flexible expansion to meet all future personnel control requirements.

For a new evaluation of Electronic Data Processing, National invites you to compare the many outstanding features of the 304 System.

Electronic Machine Sales,
The National Cash Register Company,
1217-1219 "K" St., N.W., Washington 5, D. C.

1884 National 75 YEARS 1959

* TRADEMARK REG. U.S. PAT. OFF.

*National** VERSATILE DATA PROCESSING
ADDING MACHINES • CASH REGISTERS
ACCOUNTING MACHINES • NCR PAPER

THE NATIONAL CASH REGISTER COMPANY, Dayton 9, Ohio
1039 OFFICES IN 121 COUNTRIES • 75 YEARS OF HELPING BUSINESS SAVE MONEY

EDP and Marine Corps Supply

To maintain a fast, hard-hitting instantly ready combat force, the Marine Corps needs many things. Not the least of these is an instantly responsive supply system. Working in cooperation with Remington Rand, this is how the Corps has used electronic data processing to provide such a supply system.

by Brig. Gen. W. P. Battell, USMC
Commanding General
Marine Corps Supply Center

AS THE nation's Amphibious Force in Readiness, the role of the United States Marine Corps in national defense is to provide forces of instant availability, high mobility, trained and equipped for decisive striking power. This requires trained and disciplined personnel, the finest weapons available, and a responsive supply system.

Being constantly prepared for rapid deployment under differing situations of emergency and war, geography and climate is greatly complicated by the incredible expense and complexity of the modern weapons. Procurement and parts support take a larger bite of available funds than every before.

Also, supporting forces in training and combat presents logistics problems not encountered during World War II or even as late as Korea.

Marine Corps planners long ago recognized that, if they were to successfully continue their mission, the two problems of increasing costs and expanding logistics requirements must be solved. They also knew that they had to be solved without weakening the Corps' combat arm, and with little, if any, budgetary expansion.

All facets of logistics were studied for possible economies. An obvious solution was to reduce cost and manning requirements in the supply support and reduce dollars tied up in inventory. Due to increased complexity of new weapons and their support demands this was not easy.

In beginning their work, Marine Corps planners realized that there was little to be trimmed from the Marine Corps Supply System as it existed; any solution had to rely on changed organization, methods and procedures.

Soon after hostilities stopped in Korea, an extensive study was started in business management to see what direction this change had to take. As the investigation developed, it became obvious that little could be done without radical change in Marine Corps Supply organization, methods and procedures. Only this could effect real economies while establishing more rapid and efficient supply.

About five years ago, the realization that the supply support establishment had to exploit electronic data processing crystallized into a study of supply methods needed to best meet the needs of the Marine Corps. Interim equipment and procedures—with high-speed electrical machine processing—were improved, while detailed study was made of a possible wholly-integrated computer operation for Marine Corps Supply System.

With experience developed in transitional operation and based on observations of the methods of large industrial corporations, Marine Corps was able to establish exact needs for its electronic data processing—what data would be required, what format would be most useful, and in what applications computers would work.

A fully integrated supply support system has been formed with three major supply installations, based on the Remington Rand Univac File-Computer (Model I). First to be put into operation is at the Marine Corps Supply Center, Albany, Ga. Two other major supply installations to be launched in the near future will be at the Marine Corps Supply Activity, Philadelphia, Pa., and the Marine Corps Supply Center, Barstow, Calif.

Each computer system will comprise 17 pieces of basic equipment to perform all information collecting, storing, computing, and restoring functions at the three giant supply complexes.

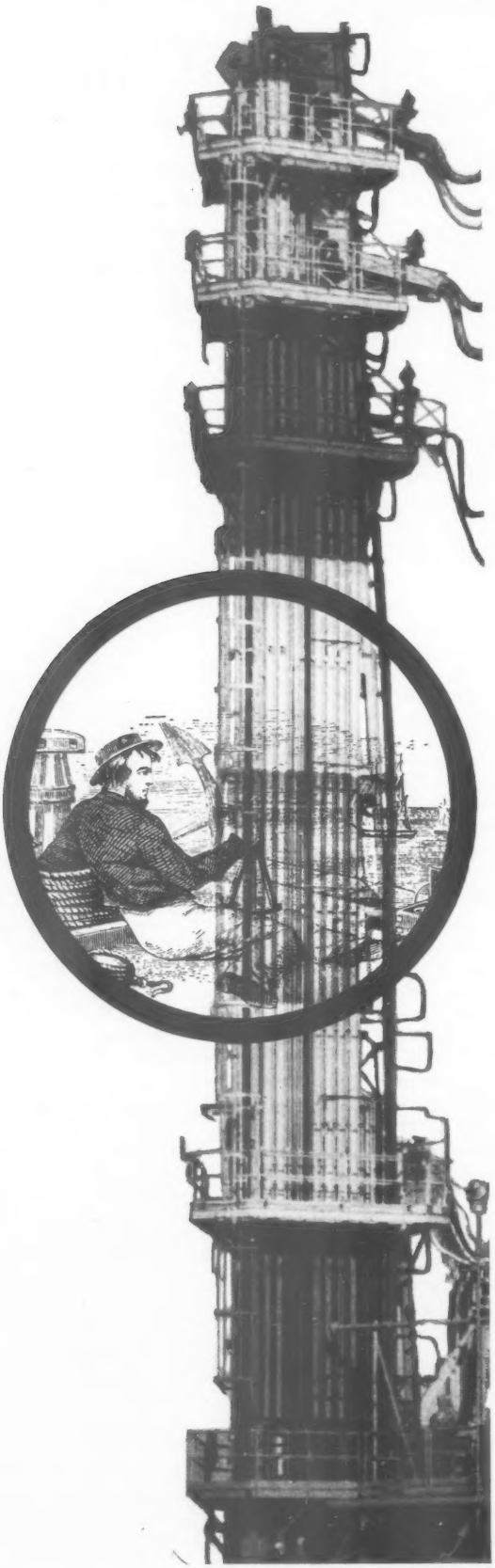
The Marine Corps Supply Center at Albany is one point in the triangular field supply control network of the Supply System. The Inventory Control Point at Philadelphia is its apex, and the similar Center at Barstow is its other point. The Center at Albany is responsible for supplying material and major repair work to all Marine Corps forces east of the Mississippi, including Forces in the Atlantic and in the Mediterranean-Near and Mid-East areas. Barstow performs the same functions for Marine Corps commands west of the Mississippi, to the Far East.

Principal customers served by Albany are the subsidiary supply storage and issue points at Camp Lejeune, the Marine Corps Recruit Depot, Parris Island, and the Marine Corps Schools, Quantico, Va. Connected by a transceiver network to the Supply Center at Albany, they are phasing their supply ordering, record keeping and other documentation into its Univac File-Computer.

Thus is made available to any customer command the aggregate stock in the complex, with nearly a quarter of a million items, with value of almost a billion dollars. At the focal point, Albany maintains the reservoir stocks for the complex, with nearly a quarter of a million inventory items, priced at over 390 million dollars.

Keeping track of the flow and replenishment of this vast store—locally and throughout the Marine Corps Eastern Supply Complex—is the responsibility of the Albany Center. Also, it must provide managerial control reports for the Inventory Control Points at Headquarters Marine Corps and the Marine Corps Supply Activity in Philadelphia.

Individual transactions in the complex run as high as 7,000 a day, all needing recording, verification and appropriate accounting operations. With the new Univac system, men and machines have combined to do the job—the need for slow and expensive manual handling, or manual punched card processing is eliminated. Any supply action at a stock point in the complex is reported daily by tele-com-



PORT OF EMBARKATION

In the decade of missilery ahead, prime contractor capability must go far beyond the requirements of hardware design and manufacture. New experience and facilities are now required in the increasingly critical launching phase—from ground handling and testing to countdown and data control.

Martin's Cocoa Division is the first organization of its kind devoted exclusively to this specialized area. Accomplishments have already established new operational standards at Cape Canaveral, one of the two U.S. ports of embarkation for the major space events of the decade ahead.

An example of the latest development in electronic fail-safe launching equipment is the new Martin Master Operations Control [MOC] system, which automatically monitors count-down procedures in the test firing of research and development-type TITAN missiles. With equipment such as this, TITAN launchings have achieved unheard-of performance reliability.

munication transceivers to Albany and transferred to magnetic computer tapes.

The transceiver-computer team ends the need for requisition on the Center by the stock points. By balancing item activity against inventory, replenishment and adjustment of stock levels are automatic. When pre-set reorder levels are reached, necessary documents are automatically produced directing shipment to fill requirements and stockage objectives.

Besides up-dating stock inventory daily in the Marine Corps Eastern supply complex, and producing supply control and shipping documents, the system provides stock control reports to the Philadelphia Inventory Control Point. With reports from Barstow, they produce a summary of overall stock in the Marine Corps Supply System, and a basis for stock procurement and distribution.

Financial accounting for these transactions is performed by Univac monthly. Normally, stock and financial control time needed to accomplish requirements will be available within routine daily work hours.

If, in daily processing for a subsidiary activity, a re-order point for an item is reached, the Univac computer determines if the item is available at the Supply Center and makes an automatic distribution if possible. If no stocks are available, an Exception Stock Status Report is created, providing the stock manager with information on the availability at other stocking points.

From this, the stock manager can tell which stocking point has stocks to meet the need, and can direct the appropriate activity to make shipment. It is not necessary to run through the entire inventory to do this, for the computer scans only those items on which supply activity has taken place during the period.

Neither is there a requirement for active and inactive stocks to be lumped together. By predetermination, the computer establishes criteria by which an item will be removed or replaced on the active list.

Among the components is a Magnetic Tape Sorting Collator, operating off-line and handling four tapes simultaneously. It automatically sorts, collates and evaluates data without special instruction, independent of any internal program the computer has in operation. It has built-in reliability checks and stops when it determines that the program requires additional data to complete an instruction.

This computer system, operated by Marines for the Marine Corps, represents another big step forward for the Corps in its never ending search for ways to keep your Marine Corps the best for defense at the least in expense.

Creating Chaos With EDP

Computer careering has opened new fields for empire building— These are the rules.

By Leonard Palmer

IF YOUR organization is studying, or preparing to study the feasibility of EDP, this may be your big chance. Grand opportunities lie ahead. You have to be aware of several pertinent facts, make your moves accordingly, and the rewards of increased prestige and income will be yours in the Golden Age which is upon us.

Take a look at the personnel complement makes up, or is due to make up the Feasibility Study Committee. If you are in a position to influence this, so much the better. The ideal Committee will be made up of four or five analysts, none of whom have had any training or experience with conventional mechanical data processing. There will be some token representation, in the form of one person assigned from the punched card accounting section. He will be in an advisory position. This Committee complement, or one like it, is important.

When the Feasibility Study Committee has completed its function and submitted its recommendations, get a copy and read it carefully. Have no fear—the "feasibility" of an electronic data processing system will be established without a doubt. Installing such a system will be enthusiastically recommended. You will be looking for two things:

1. Are any dis-advantages of a computer system indicated? If so, you will have to be careful. This would indicate that the Committee may have produced a bona-fide feasibility report, in which case they might be more concerned with the real interests of the organization. This is highly unlikely. The odds are that given the Committee complement as outlined, there will be no dis-advantages indicated.

2. Realistic cost estimates on site and systems preparation, operating costs and so forth. If the feasibility report passed the first test, it will undoubtedly come through here with flying colors. If you know nothing about such costs, there is a rule of thumb you can use: If capital investment is recovered within the first year of operation, this is the set-up for you. If the graph indicates net operating cost reductions during the first year of operation, you have struck gold. This is so far removed from reality that one might be concerned about the recommendations. Have no fear.

Now is the time to make your first move. The Committee members will be from the departments to be serviced by the computer system. Get next to the member from your department. Tell him (keeping a straight face) what a fine effort you feel the Feasibility Report was, and what magnificent benefits you foresee in the recommendations. He will mark you mentally as a prime candidate for the EDP set-up. Following this, take your next step immediately—Wait.

At this point, you may feel that with no background in data processing, and with no training or experience in the principles and techniques involved, an electronic data processing department is not the place for you. You could not be more mistaken. Such qualifications mark you for a high position in EDP. Remember—the committee members themselves (or at least four out of five) are in the same boat.

One of the first discoveries of the Feasibility Committee, in looking over other organizations using EDP, was that positions and salaries enjoyed by EDP personnel are somewhat higher than the several committee members had themselves. This leads to . . .

A "realization" by the Committee that electronic data processing is something completely new, with no precedent in your organization. This need not be a dis-honest conclusion. To the several members having no background in data processing, it probably looked like something from another planet. Couple this with the next conclusion—

Since EDP has no precedent in the organization, a choice must be made between organization personnel knowing the unique reporting requirements existing or outside people with electronic data processing experience but no knowledge of the system employed. Since the system is somehow so unique, it would be easier to train organization people for EDP operations than to train EDP people in the reporting system.

Somewhere along here, various schools and/or training sessions on the computer will come into being. Get to all of these.

A few weeks training will make you an expert in computer systems—compared to the non-schooled. Through this schooling, you will know the EDP business better than anyone but the committee members. Get what you can from the training, but if nothing else, learn the vocabulary. Learn to use these terms with ease:

Hardware—Systems concept—Intangible benefits (This is particularly important—you will use it frequently later on.)—Optimize subsequently—Eventual integration of processes—Data massaging.

There will be others, and you will learn to recognize them. Listen to your department committee member. He will know and use all of them by now. I could list the definitions, but you need not know what they mean. If you find out too soon, you may use one at the wrong time.

The organization of your EDP group

Learn the terms—
not the meanings . . .

may add the frosting to the cake. Look for a set-up which will effectively resist direction and/or control from any management other than the EDP group members. If the departments to be serviced have their own programmers, so that you have two, three or four programming groups—you have found the ultimate.

There are additional safety devices available when you really need them. A computer system involves everyone sooner or later. While no one will admit to any responsibility, everyone knows that someone must be responsible. So when it comes time to cover the whole thing up, just grab a can of whitewash and a brush. You will, like Tom Sawyer, find many friends to help. When the finger pointing starts, everyone will be pointing at everyone else, and you can simply join the chorus. But point with one hand only. Reserve the other hand for pointing at the computer. It is the best group insurance ever devised. It will not be hard to convince management, yourself, your associates and your immediate family that the "monster just never does work right."

You have waited outside the EDP group long enough. It is time to get in

Save one finger to point
at the computer . . .

and wait. Due to accounting technicalities which we shall go into later, you may either apply for the position you want or you may simply be detailed into it. In no event should you accept a position which does not move you up, both in position and salary, at least two steps.

If you fill out an application, be careful. If you have any machine accounting background, avoid showing it. This is not to say that such background will exclude you, but the odds are about 10 or 12 to 1 against having such experience in the EDP organization. There is good reason. People who know about such things as card form design, report lay-outs, procedure development, coding techniques for mechanized functions, panel wiring, scheduling and the like have pre-conceived ideas. EDP being entirely new, this it not good. You should approach the whole thing with an open (or empty) mind.

From the day you join the EDP group to the "scheduled computer installation date" will be about a year. To this you may add another six or nine months before actual delivery. This gives you something like a year and a half which is known as either the systems preparation or the honeymoon period. During this time you will be drawing charts for everything short of total mobilization. Don't worry about the first sets. During the second third of this period, you will be revising the charts drawn in the first third. And so forth. Don't confuse "revising" with "refining." The former is done prior to operations. The latter is a safety valve to provide limitless stock answers later on. For example, to the question "How come none of your reports balance?" you will be able to come right back with "We plan to take care of that during refinement, upon which we are now starting."

The only drawback to the whole EDP operation—a minor one at that—is that time will pass. One day a real live computer will be installed in what was a $25,000 computer room in the feasibility study, but turned out to be a $125,000 Data Processing Center in reality. As we said previously, by this time it will be too late to do anything about it, and you will have many friends. Everyone will be your friend —with one exception. The Department of Defense.

But you will have out-foxed them. Planning is the answer. Preparation. I do not mean planning and preparation for computer operations. That would not do, nor do we have anyone to do it. I mean planning and preparation for the Department of Defense. This is what you have done during the past year and one half.

It can be done. Not with actual operating procedures, since these would not support the "savings" and "benefits" indicated in the feasibility study. Even though these figures have been revised steadily upward, they still indicate a recovery of capital investment, and net operating cost reductions—not to mention reporting benefits. There is another way. The committee from DOD will run into a snow storm that will make the blizzard of '88 seem like a spring thaw.

You will have helpful devices, such as do-it-yourself accounting techniques. These enable you to come up with any desired "cost" figure. For example, if you took the number of hours worked in the EDP program, and multiplied it by the hourly rates involved, you would come up with the actual systems preparation cost. However—this would amount to something like three times more than the feasibility study estimate, and the most expensive part yet to come.

The people on the EDP project, when they moved into it, left vacancies in their old section. These were never filled. Consequently, the overall personnel load was not changed. Therefore, there really isn't any cost involved at all, since those people would have drawn salaries in their old jobs. All of the people involved are now receiving more money, so you will simply charge the difference to EDP preparation costs.

Next, get yourself into the proper frame of mind for the DOD readiness hearing. This is a tactical operation. The objective is simple—a computer. But the people from DOD are too dense to comprehend this, so don't put it on that basis. The DOD team is the Enemy. They are there to block you in your attempts to accomplish your mission. In a year and a half or better, you should have enough papers drawn up to confuse an army. There will be orientation meetings for the Enemy. There will be presentations. There will be available all manner of Memos, Letters, and Progress Reports so worded as to convince the most skeptical among the Enemy that training, planning and everything else has progressed "satisfactorily, although we are slightly behind schedule in some areas due to the revolution in Iraq."

If you are not yet in the right frame of mind, let me put it this way—your job depends upon getting the computer in. Not working, just in.

If you figure the "fool them" campaign probably won't work, you are correct. There will be another slight delay in computer installation date, while the first shake-up, or re-organization, takes place. Don't be alarmed. With all due respects to those who will

try, a computer cannot be ordered to function. Nor can a programmer. Keep the magic words in mind at all times: "I am doing my best." No one will devise an effective answer to that. And you will have the added strength of honesty.

It will come with either the first or second re-organization. It may be formal, or it may be informal. In either case, it will be hot. This is the half-million dollar lynch party. The Vigi lantes will be out in force, trying to decide who will get hung. You have but to keep a clear head, remain calm, do not panic. By this time the four week parallel operation planned for conversion of the files to the computer system will have consumed some four or five months, and will not be working yet. The cost is all but impossible to hide. There is no telling who will be called in and questioned, but for the sake of analysis, let's assume that everyone from the top down gets to dance. For your peace of mind, I will run down the question and answer period for you. Remember those portions which apply to the position you hold.

Question: "So what happened?"

Answer (Number One Top Boss): "The facts are clear. I was responsible for administrative management of personnel assigned from my department to the EDP group. I saw to it that they had every possible assistance. There are no programmers or technical people on my staff, and this was a technical project. Repeated briefings and follow-ups by myself and my subordinates revealed no more than that everything was progressing. I was not here at the time the Feasibility Study was submitted and subsequently accepted, and so have no responsibility in that regard."

Question: "Did you keep tabs on this EDP project?"

Answer (Subordinate of Number One Top Boss): "Insofar as my assigned duties required, yes. However, my function was not to judge the competency or accuracy of EDP systems development. It was for me to report to my superior that EDP, as established, would or would not work. All reports from the EDP group were positive. I would have no way of knowing, one way or the other, whether the actual programs and detailed planning were or were not accurate technically. I am not a programmer, nor am I a data processing technician. When the EDP system went into operation and did not work, I so reported."

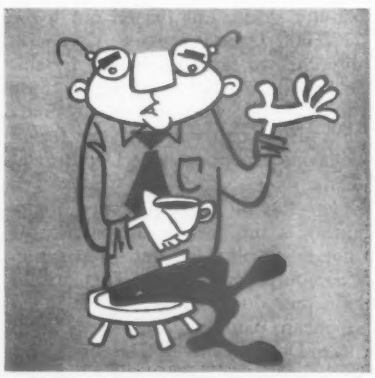
Question: "And where were you when Grandma flung the mud?"

Answer (Second Subordinate, Same Department): "You will understand that the EDP group as such, came under the technical management control centered outside my department. Without such control, there is not much which management might reasonably be expected to do, and consequently, when such control is assigned elsewhere, commensurate management responsibilities are concurrently assigned."

Question: "Well?"

Answer (Senior Programmer, Same Department): "Programming is at best a highly technical proposition. I came into the EDP organization with no technical background at all, to do what I considered an important job in the department. In establishing a computer system, there are many, many factors involved. Each one lends just that much more possibility of error. The computer itself has been erratic and not always dependable. We were not able to get sufficient time, prior to installation, to de-bug and fully test out our programs. It has been very trying, attempting to get the cooperation of various sections and personnel who cannot or will not appreciate the systems implications of a computer. We cannot look back at this point. We are now working harder than ever to get the show on the road. In view of the experience we have gained in the past six months or more, we should be able to work our way out shortly. At all times, I and my associates have done our very best."

If you have not been questioned yet, meaning that you are below this spot in your department group, you have nothing to worry about. Just use the magic words: "I have done my very best."



"I have done my very best" . . .

Question: "Let's see if I can guess this. You were not a technical man, but rather involved in the various aspects of administrative work. Selections of personnel were based upon aptitude testing, board interviews and such, and the most competent people available were, you assume, chosen. Since you were not familiar with the reporting functions and requirements of the various departments involved, you could hardly choose to question the legitimacy of the various computer system approaches or subsequent programming. You feel that under the circumstances, administration was at least adequate. Further, with the planned re-organization and other management moves which you have outlined after careful study and due consideration, large strides forward will be effected."

Answer (Head of All EDP Operations Everywhere): "Right."

Question: "Did you direct and coordinate programming everywhere?"

Answer (Assistant Head, In Charge of Computer Programming Everywhere): "When you come right down to it, you recognize that the several departments involved—and hence, the personnel assigned to departmental programming functions—had, in fact, coordinated their activities for years. They had always, in effect, operated "together" insofar as togetherness was required to perform their various functions. The computer system did not change any of this as such. The programmers from the various departments knew better than anyone else where more less co-ordination might be required. In addition, I did not come into the program until it had been in operation some 8 months to a year. It took some time, as you might imagine, to catch up with what had gone before. I was not familiar with the day to day detailed operations of each of the departments involved. In view of all this, my activities were confined for the most part to establishing common de-bugging criteria, gathering programming information from other organizations and screening it all for whatever might be helpful to our people, and providing what technical assistance was requested. Any and all programmers were free to request such assistance at any time. That more was not deemed necessary is not for me to judge."

We need not go on. If by this time you are convinced that such things do not happen, and there just isn't any such organization anywhere I can say only this: There is, my friend, believe me, there really is.

engine power
BY CATERPILLAR

Dependable power for the Air Force from Caterpillar Diesel Electric Sets

The jets get much of the glory in today's air world. But without dependable electric power on the ground, the greatest of our new planes would never fly. At many bases, the Air Force, with its Strategic Air Command, has turned to Caterpillar Diesel Electric Sets to supply that power economically and reliably.

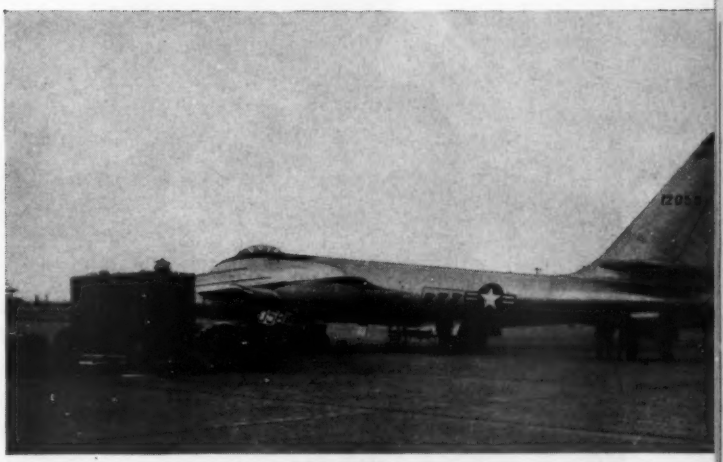
Cat Electric Sets are used for jet engine starting and calibration of vital aircraft electronic control systems. Cat Electric Sets power radar warning devices and missile tracking stations. They provide primary and also emergency standby power for base facilities and homes at many installations.

Investigate Caterpillar Electric Sets any time that you need long-lasting dependability . . . or trigger-quick starts in an emergency. Special high-strength materials, strong reinforcing where necessary and simple design give them the stamina to supply steady power day after day without letup. Automatic cut-in feature for standby use brings them on the line in 4 to 8 seconds, average, when you have a commercial power failure.

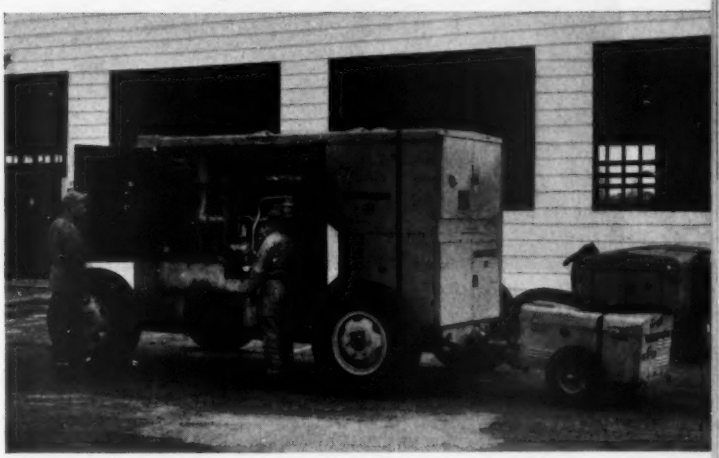
For more specific facts, get in touch with any Caterpillar Dealer Engine Specialist or write for our descriptive booklet.

Engine Division, Caterpillar Tractor Co., Peoria, Ill., U. S. A.

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.



For a fast start, **this Caterpillar Portable Electric Set is used to start jet engines and calibrate electronic systems at a SAC base.**



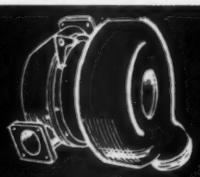
Never without power **at this Air Force proving ground, because dependable Caterpillar Diesel Electric Sets supply standby power for base utilities, radar, training schools, etc.**

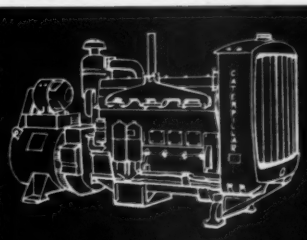
CDES—CATERPILLAR DEALER ENGINE SPECIALIST can help you with any problem or question you have concerning diesel electric power.

TURBOCHARGING gives more horsepower per pound of engine weight in Cat Diesel Engines and lowers the heat load on the cooling system. It is standard on most Cat Engines.

SIMPLE—Caterpillar Electric Sets for both primary and standby power are dependable, easy to operate and need little electrical equipment.

CDES





NAVY: 400 pounds . . . 704 miles for only $31.90?
ARMY: Got a TWX already. Out this morning—there now.
NAVY: But that's $8.70 cheaper than . . .
ARMY: . . . surface? Right! Scheduled Airlines Air Freight is always faster . . . and often costs less!*

*Always ask . . . "how much by air!" Let Scheduled Airlines Air Freight save you time and money.

THE CERTIFICATED **Scheduled Airlines** OF THE U. S. A.

AAXICO AIRLINES
ALLEGHENY AIRLINES
AMERICAN AIRLINES
BONANZA AIR LINES
BRANIFF AIRWAYS
CAPITAL AIRLINES
CENTRAL AIRLINES
CHICAGO HELICOPTER AIRWAYS
CONTINENTAL AIR LINES
DELTA AIR LINES
EASTERN AIR LINES
ELLIS AIR LINES
THE FLYING TIGER LINE
FRONTIER AIRLINES
LAKE CENTRAL AIRLINES
LOS ANGELES AIRWAYS
MACKEY AIRLINES
MOHAWK AIRLINES
NATIONAL AIRLINES
NEW YORK AIRWAYS
NORTH CENTRAL AIRLINES
NORTHEAST AIRLINES
NORTHERN CONSOLIDATED AIRLINES
NORTHWEST ORIENT AIRLINES
OZARK AIR LINES
PACIFIC AIR LINES
PACIFIC NORTHERN AIRLINES
PIEDMONT AIRLINES
RIDDLE AIR LINES
SOUTHERN AIRWAYS
TRANS-TEXAS AIRWAYS
TRANS WORLD AIRLINES
UNITED AIR LINES
WEST COAST AIRLINES
WESTERN AIR LINES

Procurement Trends

BURIED UNDER THE DIVERSIONARY ONSLAUGHT over officer hiring, the real problem—negotiated procurement—will eventually move back into the limelight, probably by August. One more-than-likely outcome of future hearings: Renegotiation Board's authority to give services permission to make incentive payments will be stricken from their job description, in essence, can mean Services will no longer use incentive-type contracts.

COST PLUS FIXED FEE CONTRACTS DON'T LOOK GOOD to at least one segment of the Army, as represented by Brig. Gen. Earle Cook, high-ranking Army Signal Officer. His complaint: "I'm not convinced these contracts are wise or necessary." His reasons: Several contractors consulted have said that under normal invitation to bid situations, they would have undercut the CPFF contract prices by an average 10%.

PENTOMIC THEORY, BESIDES ORGANIZATIONAL RESULTS, has resulted in a considerable impact on Army hardware procurement. Communications gear has felt a tight squeeze because of the new doctrine. As a rule of thumb, a given piece of electronics/communications gear is now needed one echelon lower across the board, with the corresponding multiplication of numbers. This has occurred in the face of a cut in communications funding from $465-million to $180-million.

CLOSER TIES BETWEEN AF DEPOTS AND THEIR CONTRACTORS— from both geographical and managerial standpoints—will be one Air Force means of coping with the upcoming missile supply problems. Because of the close touch, changes in the missiles will be able to be incorporated at the earliest possible time, with the least possible strain on all concerned.

AMONG THE BIGGEST HEADACHES IN STANDARDIZATION WORK in the Army—as well as the other services—is the existing procurement structure. As soon as Army Engineers, for instance, "standardize" on one type of earth-mover, the contract under which it was being purchased runs out, the whole thing is open to fresh bids. Likely result: the original manufacturer is undercut, and Army finds itself having to start from scratch with brand-new provisioning for a brand-new piece of equipment.

SUCCESS OF THE AIR FORCE QUALITY CONTROL PROGRAM is clearly indicated by the recent adoption of the system by Defense Department. The new specifications, which will be used by all services, is a direct outgrowth of AF MIL-Q-5923. The system will provide that all contractors use a common system, insuring control of all functions from raw material purchases to finished product.

ONE EFFECT NOT LIKELY FROM THE DEFENSE "MASTER PLAN" is any cancellation on cutback on the F-108 interceptor, said to be of the same generation as the B-70 chemical bomber. Said Defense Secretary McElroy at a recent press conference: "There is no development program on any interceptor beyond those that we now have in production, with the exception of the F-108. If we give up the F-108, it will mean that we have decided that it's not necessary to go beyond the present generation of interceptors . . . and this is a fairly serious kind of decision."

DYNA-SOAR DECISION WILL PROBABLY BE DELAYED by the Air Force until after Congress is through with the 1960 budget. Original decision date—late May or early June this year—has come and gone, and no move has been made.

EXTRA PROCUREMENT CASH FOR A C-47 REPLACEMENT—most likely the Fairchild F-27—seems likely to be granted by the Senate. Funding would probably allow for about 10 of the planes. While the House has been cool to the idea, a bit of log-rolling in the conference committee, coupled with a strong Senate argument, could possibly do the trick.

Procurement Officials Rated Low in Survey

None of the military procurement officers who deal with defense contractors are in the top government pay brackets. A recent report to the House Armed Services Investigation Subcommittee shows that only 2% of the non-negotiating employees draw pay ranging from $13,000 to $16,000.

Result of a year-long study, the report stemmed from charges that government contracting personnel lack experience and background to deal effectively with highly-paid industrial contracting officials. The report was presented in statistics, and while comments were made, no conclusions were drawn.

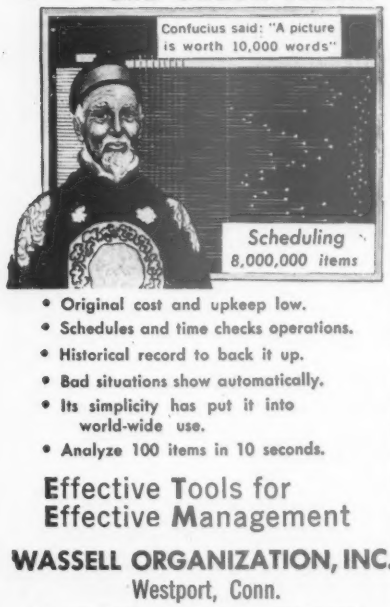
The study said that 64% of 3,567 procurement personnel surveyed "apparently had no experience in private business purchasing before going to work for the government. Many never held a position of any kind in private industry, other than part-time or summer employment."

Further, the report noted that "in the important supervisory positions, 64% had no experience in private business in supervising personnel or in any type of purchasing," and that "among the 1,240 procurement personnel who negotiated or otherwise contracted on behalf of the government, 67% had apparently never held a private position which bore any relationship to purchasing."

PRODUC-TROL Visual Control

not only schedules,

But **automatically checks with TIME, LINE and COLOR control**



- Original cost and upkeep low.
- Schedules and time checks operations.
- Historical record to back it up.
- Bad situations show automatically.
- Its simplicity has put it into world-wide use.
- Analyze 100 items in 10 seconds.

Effective Tools for Effective Management

WASSELL ORGANIZATION, INC.
Westport, Conn.

For more facts request No. 8 on reply card.

Source Selection Board Procedures Set in AFR

Air Force has published the first official document outlining approved procedures for forming and conducting a System Source Selection Board. Policy, responsibility and procedures for selecting system sources are outlined in the new Air Force Regulation, AFR 80-3.

Formerly the Source Selection Boards were formed and operated on an as-needed basis, with "each case treated as a special case, and the resulting varying procedures," according to one Air Force source.

The new regulation specifies that Hq., USAF will issue the needed directives to form the board, and have the final decision in picking the source. ARDC, AMC and the using command will designate board members and work out all detailed procedures. ARDC will send a senior officer to each of the boards to act as non-voting chairman.

The board may be divided into teams to check out various aspects of the system. Majority and/or minority reports are sent to each of the major commanders involved, who make their selection and turn it in to Secretary of the Air Force Council, where the final decision is made, by Chief of the Air Staff or Secretary of the Air Force.

Navy BuOrd Computer To Control Inventories

All of Navy's missiles and ammunition have come under the control of a new electronic data processing system, the Radio Corporation of America's 501 high-speed, all-transistor EDP system.

Installation of the computer signalled the beginning of a five step program which eventually will control all logistics on non-expendable items, besides financial management, quality evaluation, and research project management.

The RCA 501 will place Navy's world-wide inventory setup on a daily basis, phasing expendable ammunition flows between the fleet and shore facilities. The new system will theoretically save some 1,100 manhours daily.

The system will consist of a main control computor console, paper tape reader and monitor printer, high speed memory storage unit, eight magnetic tape stations, an electro-mechanical printer, a transcribing card punch and a paper tape writer and verifier.

Naval Weapons Bureau OK'd by House Group

House Armed Services Committee has approved the proposed merger of Navy's Bureau of Ordnance and Bureau of Aeronautics, to form a Bureau of Naval Weapons. This represents a major step forward in the proposed reorganization of the Navy as recommended by the Franke committee.

At AFM presstime, the resolution (H.R. 7508) was not scheduled to go before the full House. According to Navy Secretary W. B. Franke, "primary objective of the reorganization of a technical bureau must be to reduce the lead time between the expression of an operational requirement and the delivery to the combat forces of a fully developed and effective weapon or weapon system."

Contracting Procedures Tightened by Air Force

In answer to recent charges of loose procedures by General Accounting Office, Air Force has created 203 new auditing positions to tighten up contracting methods, and begun a program aimed at reinforcing its contracting rules.

GAO had charged that loose contracting practices are costing the government millions of dollars annually. The Air Force program was outlined for the House Armed Services Investigating Subcommittee by top officers in Air Materiel Command.

Besides considering action to require contractors to notarize cost statements, the Air Force program will (1) amend procurement rules requiring contractors to submit a certificate showing all cost data is up to date, (2) issue a letter stressing the importance of the auditor in contracting work, (3) send letters to three "major industrial associations" drawing their attention to cases involving faulty data, and asking them to take corrective steps, and (4) direct all major procurement centers to review pricing information on still-active redeterminable and incentive contracts to insure accuracy, negotiate readjustments where needed and to obtain validating statements from the contractor.

Procurement rules have also been

changed to force AF buyers to analyze contractor proposals thoroughly, get current, complete and significant cost and pricing data, and to secure information of the types of subcontracts that will be used.

Mathematical Formulas To be Used in Supply

Navy is now using mathematical decision making in its supply provisioning work, with the installation of a Burroughs 220 Datatron at the Ordnance Supply Office in Mechanicsburg, Pa. The new automatic data processing will be used in support work on the Polaris missile system, and overall supply work.

The new system will be used under a new Navy management concept, which combines decision formulas and electronic data processing for provisioning work. The formulas are presently being developed at Bureau of Supplies and Accounts, with the cooperation of Planning Research Corp.

The new system will also be used on allowance lists, stock lists, usage data, management statistics and other areas of inventory control. Included in the computer installation are a data processor, seven magnetic tape units, a complete paper tape input/output system, and a Cardatron sub-system for controlling three punched card input/output machines.

Helicopter Contract Announced by Army

Army has announced awarding of a $6-million initial contract for development of a new transport helicopter, called Chinook. Expected to carry 33 passengers or three tons of cargo, the rotary craft will be developed by Vertol Aircraft Corp.

To be turbine powered, the craft will have ramp-loading characteristics to allow fast loading. For outsize items, the ramp may be left open in flight. The Chinook will cruise at over 125 mph, with the first of five prototypes to be rolled out by Vertol in November, 1960. The craft will be powered by two T-55 shaft turbine engines.

Air Force Releases Stock Fund Regulation

Air Force Regulation 67-20, covering management of the Air Force Stock Fund's POL, Clothing and Commissary Divisions, has been released by the Office of the Secretary of the Air Force. The AFR established basic policies, and delineates specific areas of responsibility pertaining to this area.

Outlined in the AFR are the responsibilities of Hq., USAF, Comptroller of the Air Force and Air Materiel Command. Overall control will go to AF Deputy Chief of Staff for Materiel, and will be implemented on the working level by AMC. Financial responsibility will fall to the AF Comptroller.

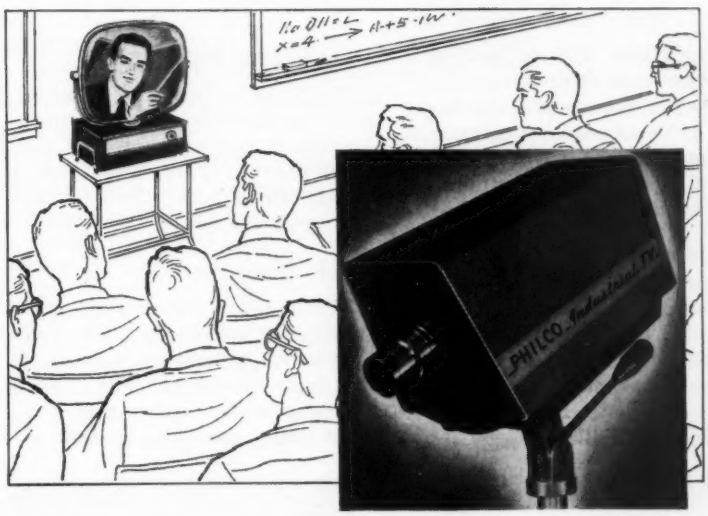
Correspondence Course Set by Military School

The Industrial College of the Armed Forces is now offering a graduate level correspondence course to qualified civilians in business, industry and the professions, as well as selected officers of the reserves and active forces.

Based on the curriculum of the regular 10-month resident course at the college, the course will be called "The Economics of National Security." Theme of the course is the interdependence of military and economic structures in the national situation. The course takes roughly one year for completion.

Interested personnel can apply to Commandant, Industrial College of the Armed Forces, Washington 25, D.C. There is no charge for the course.

First from PHILCO®...



New All-Transistor TV Camera for Schools at **only $1445**

Here's the camera that makes educational TV practical—dependable and trouble free . . . at a saving of hundreds of dollars.

A lightweight, maintenance-free, foolproof camera that anyone can operate. No matter how large the audience . . . now, everyone can participate in lectures, demonstrations, classroom sessions. Compare the quality of this newest Philco TV camera with *any* other. To improve the quality of your audio-visual program . . . at dramatic savings . . . insist upon Philco TV.

Place your order now to assure early delivery. Write for Philco TV Planning Book. *Government & Industrial Division, 4702 Wissahickon Ave., Philadelphia 44, Pennsylvania. In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario.*

PHILCO QUALITY FIRST!

For more facts request No. 9 on reply card.

these heavy-duty haulers save time three ways

You can put your off-road hauling of dirt, rocks, and other heavy materials on a fast, mass-production basis with LeTourneau-Westinghouse Rear-Dumps. Here's how they save time on all three basic operations: loading, hauling, and dumping.

fast loading

Tournapull's 90° turn-ability gets L-W Rear-Dumps under shovel *quick*. Wide, clear top opening gives loader big, easy target. Clean, tapered bowl flows materials toward center, cushioning load shock. Low, wide design cuts spillage.

steady hauling

Exceptional pull-power, traction, and gear selection keep loads moving steadily cross-country or over rough haul roads at fastest practical speeds. Tires give top flotation; low gravity center assures stability.

quick dumping

Electric hoist motor tilts body sharply, for *clean* unloading. Body lip extends beyond rear wheels, to cast material out and away. Fast, *precise* electric controls permit instant dump, controlled spread.

rough going no problem

LeTourneau-Westinghouse Rear-Dump bowls are powered by world-tested Tournapulls — rugged, 2-wheel prime-movers. 'Pulls go anywhere — through mud, snow, floods, sand, bombed-out areas. They get needed traction in rough going with help from exclusive L-W power-transfer differential . . . which automatically transfers up to 80% of power to wheel with the best footing. In soft footing? Simply "duck-walk" out, using 90° electric kingpin power-steer to swing prime-mover from side to side.

fingertip switch control

Dumping and steering are actuated by fingertip electric switches. Giant air brakes, combined with Electro-tarder for auxiliary flywheel brake power, add safety. Maintenance is low in any climate, because highly simplified Tournapull® Rear-Dumps eliminate so many unessential parts. All-welded, reinforced steel bowl resists wear and shock. Experienced servicemen and operators are available around the globe.

Check the advantages of LeTourneau-Westinghouse Rear-Dumps for military use. Ask for complete specifications. Rear-Dumps available with 11, 22, and 35-ton capacities.

R-1346-ML-1

LeTOURNEAU-WESTINGHOUSE COMPANY

A Subsidiary of Westinghouse Air Brake Company

FACTORIES in Peoria, Illinois; Toccoa, Georgia; Indianapolis, Indiana; Sydney, Australia; and Campinas, Brazil

Where quality is a habit

Government Sales Dept.

Peoria, Illinois Ph. 3-4521
916 Ring Bldg., 1200 18th St. N.W.
Washington 6, D.C. Ph. Republic 7-7445
994 Pacific Electric Bldg., 610 S. Main St.
Los Angeles 14, Cal. Ph. Michigan 9-717

Research Rundown

AN INDICATION OF HOW CRITICAL COMMUNICATIONS WORK has become was shown at the recent Armed Forces Communications and Electronics Association convention. Said one speaker, "I hope someone here will be able to disagree wtih me, but to the best of my knowledge, we have not yet been able to develop a voice communications system that is fully reliable for a distance of one hundred miles." There were no takers.

A NEW TYPE OF TACTICAL RADAR IS UNDER DEVELOPMENT by the Hazeltine Corp. Working with both sight and sound, the new system is said to be able to detect troop movements up to fifteen miles away. The system will be probably unveiled at this years Association of the U.S. Army Convention, with further details to be released at that time.

ARMY AVIATION NEEDS IN 1959-70 ARE BEING ANALYZED by Continental Army Command, with Army Aviation School doing the legwork. Aiming at a standardized six-type air fleet instead of the present fifteen, Army is thinking in terms of the following: (1) Light, unarmed air observation vehicles, (2) medium air observation aircraft, (3) heavy observation aircraft, (4) VTOL utility aircraft, (5) VTOL transport, and (6) and STOL transport.

NAVY HAS FLATLY DENIED RUMORS OF A POLARIS-ALBM, contrary to rumors which seem to originate in industry. Such a program would immediately create rivalry with two Air Force programs—their Air Launched Ballistic Missile, and a nuclear-powered plane to carry it. Adding weight to this is the lack of any money set aside for such a program.

ADDITIONAL WORK FOR ADVANCED RESEARCH PROJECTS AGENCY, in the form of $15-million worth of materials research, further dampens rumors that that agency is on the way out. Both Defense Secretary Neil McElroy and R&E Director Dr. Herbert York have firmly endorsed ARPA, and the backlog of business continues to grow.

ONE OF THE HOTTER POTATOES AROUND IS ALL-CARGO PLANE that is supposed to be developed jointly by industry and the government. The ideal plane would carry four or five large missiles (the C-130 carries one). Plane will just about definitely be turboprop powered, with a large enough engine being one of the present major headaches. One long range possibility: a smaller but faster craft based on the B-70 chemical bomber.

AIR FORCE IS BORROWING A PAGE FROM NAVY'S SAFETY RULE BOOK, is seriously considering installation of arresting gear at its many airfields. Preliminary installations are complete. Aim is to cut the number of planes and pilots lost by under and/or overshooting runways.

AS IF MISSILE RELIABILITY WEREN'T ENOUGH OF A PROBLEM, Cape Canaveral space technicians have found themselves checking out the hometowns of monkeys. Seems an international incident was barely avoided when it was found that the original rhesus Monkey Able was born in India, where the rhesus monkey is considered sacred. Solution: quick substitution of an Independence, Kans.-born monkey.

INTERSERVICE RIVALRY BETWEEN ARMY AND SPACE CADETS may arise from a recently stated Army requirement. What they want: a controllable lift device to be used in lieu of parachutes for descending from air vehicles. The device would also be used for movement over rough terrain.

Communication Lag Weapons, Says LeMay

"Our communications are continually lagging behind the needs of our rapidly expanding operational requirements," according to Gen. Curtis LeMay Air Force Vice Chief of Staff. Speaking before the Armed Forces Communications and Electronics Association convention, LeMay cited a "vital need" for greater effort, new thinking and new equipment in this area.

LeMay called the communication satellite "an encouraging possibility," and called for further work in the following areas: (1) range extension and more thorough channelization of tropospheric scatter systems, (2) improved reliability and security in data, voice and picture cryptographics, (3) greater speed for record type communications (see p. 16, this issue), and (4) a reliable world-wide voice capability.

LeMay called for systems which would meet the needs of all services fully, and said "our equipment must meet the full demands of our military systems and must be completely responsive to the needs of the men who control and operate these systems."

Machine that Reads Developed for AF

An information machine which reads type-written pages has been developed by Intelligent Machines Research Div., Farrington Mfg. Co., for the Air Research and Development Command. The machine—MX-2021—reads and translates material to electrical signals at 200 characters per second.

The result of a two-year development program, the Print Reader is said to be "far more advanced" than similar machines. The machine can read ordinary typing, including upper- and lower-case characters, punctuation and numerals.

Because it translates what it reads to electrical signals, the machine avoids subsequent manual handling of data in such processes as communications, indexing or abstracting. Formerly, information was entered on similar machines by a keyboard operator.

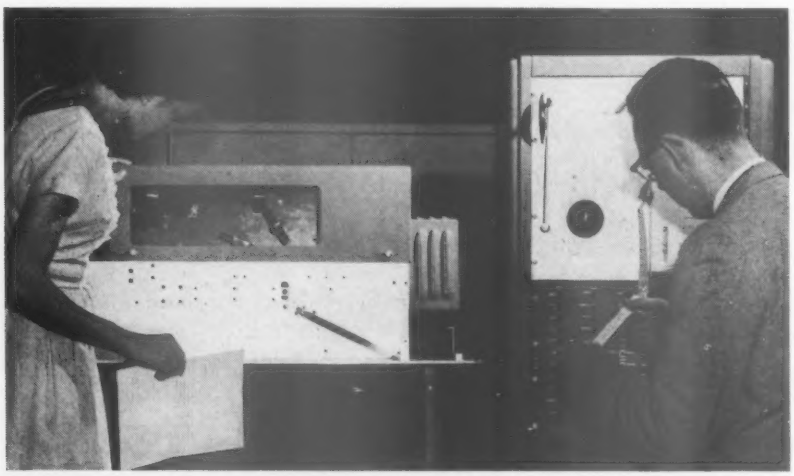
While the machine now reads only one type style, further research may allow it to read all type styles.

Details Released On 212L AWC System

The Air Force-sponsored 212L Air Weapons Control system, being built in part by General Electric Co., will have the capability, through a systems linking arrangement—to detect and track all air-borne targets in an area as large as Western Europe.

While single units may be used with such pin-point locations as missile sites, the ability to link more than one of the systems makes the mobile electronics system completely flexible. The 212L will be able to control both manned and unmanned interceptors, and to coordinate or direct anti-aircraft missiles.

Altogether, the system will serve nine functions: (1) provide air situation picture in seconds, (2) transfer data from site to site automatically, (3) yield high capacity and performance, (4) aid weapons assignment with computers, (5) control mixed weapons, (6) provide recovery and air traffic management, (7) give automatic 3-D detection while tracking and scanning, (8) initiate automatically, and (9) provide manual override to counteract attempted jamming.



Howard Silsby, right, engineer-builder of the Air Force's new Print Reader, examines punched tape output while new document is about to be inserted in scanner at left. Computer proper, partially hidden, is in background.

Turboprop Nuclear Plane Pushed Along by Navy

Navy and Pratt and Whitney Division of United Aircraft Corp. will shortly sign a contract under which P&W will develop hardware for a nuclear powered turboprop engine. P&W is also developing the reactor under an Atomic Energy Commission contract.

Saunders-Roe Princess flying boat will probably be used as a test-bed in the program, although there are only about three available for this.

In other A-plane developments, V. Adm. William G. Cooper, commander of Navy's Atlantic anti-submarine defense force, has said that Navy does not need a nuclear aircraft for ASW work. Cooper called for double the present number of conventional aircraft assigned to this work, or about 400 in each ocean.

ARPA Here to Stay, Says Agency Chief

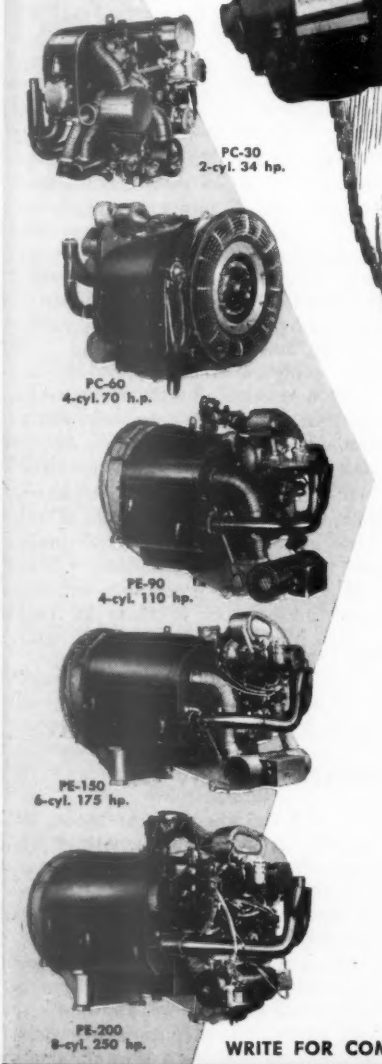
Advanced Research Projects Agency will continue to play an important part in Defense research programs, as research becomes more of "a way of life" in DOD operations, according to ARPA Chief Roy Johnson.

Backing up Johnson's statement more recently was Defense Secretary Neil McElroy, who said that ARPA was more likely to increase in size than to be cut back or abolished.

Johnson told the Stamford/Greenwich (Conn.) Management Council that his agency would continue to use the facilities of the three services to fill two basic organizational concepts.

The first of these concepts, he said, "is that looking into the future in priority areas should be institutionalized and delegated to a group at the top management echelon, under a director of ARPA, or 'vice-president for crystal ball gazing.' The second is that the technique and ability to use competence where it exists should be employed as a more efficient and economical alternative to building in-house capabilities."

Muscles for the Missile Age!



. . . Continental Packettes Are Approved Power for a Wide Range of Ground Support Equipment

Nearly 50 different items of ground support equipment, now in use all over the globe, are built around the unique family of Military Standard engines developed by Continental Motors and designated as Packettes. These approved power plants (Mil. E6449-A) are adapted to the needs of equipment for all branches of the Armed Forces. They are already in being—in fact, in volume production—for such units as air conditioners, compressors, crash trucks, generators (gas and electric) refueling systems, heaters, blowers, Teracruzers, multi-purpose tugs, and many others. For the five Packette models, from 30 to 250 horsepower, offer a combination of advantages available nowhere else:

1—The proved dependability of the Continental aircraft engines on which they are based.

2—Adaptation to use in any climate, from the equator to the pole.

3—Lightness, simplicity, and ease of servicing, resulting from their air-cooled design.

4—Wide interchangeability of parts among companion models, and also among models of the standard Continental aircraft engine line.

●

IF THE APPLICATION FALLS WITHIN THEIR POWER RANGE, NO OTHER POWER WILL DO THE JOB SO WELL

WRITE FOR COMPLETE INFORMATION

Continental Motors Corporation
Aircraft Engine Division MUSKEGON, MICHIGAN

CONTINENTAL MOTORS® Powering the Nation AMERICA'S STANDARD

Spot and prevent trouble at a glance

NEW! VU-BOARD®

BY THE ORIGINATORS OF WALL BOARD CHARTING AND PRODUC-TROL

Low cost — unlimited Visual Control

- Shows all important data—a fast, accurate, complete picture
- Easy to set up and operate—wall or desk use
- Boards fit together horizontally or vertically to increase item capacity
- Inserts can be shifted *without* removing from board
- Solves all machine load problems
- Unlimited uses for scheduling, charting, dispatching, etc. — in all phases of business and industry
- Light, compact all metal construction—designed for a lifetime

Only $49.50 complete

PATENTED

Phone Westport, Conn. CA 7-4111 or write

WASSELL ORGANIZATION, INC.

Westport, Conn.

IN USE IN ALL BRANCHES OF GOVERNMENT
WRITE FOR NEW BOOKLET "VU-BOARD"
or
Consult our GSA Federal Supply Service Contract
FSC Group 74, Parts III & II.
GSA Contract Number GS-00S-18325
Item Number 50-63

For more facts request No. 2 on reply card.

Common Stock Investment Plan

For as little as $10 a month you can purchase shares in HAMILTON FUNDS. Hamilton is an investment fund holding common stocks of over 80 corporations, selected for income and growth possibilities.

Hamilton Funds

HAMILTON MANAGEMENT CORP.
Dept. H-4 Box 5061, Denver 17, Colo.

Please send prospectus-booklet without obligation.

Name_____

Address_____

City_____ State_____

For more facts request No. 3 on reply card.

Industry Developments

New Magnetic Tape Improves EDP Work

A new "sandwich construction" magnetic tape has virtually eliminated oxide rub-off on recording heads—formerly one of the biggest headaches in electronic data processing.

The new tape incorporates a 50 micro-inch plastic layer which shields the tape's iron oxide coating from direct contact with recording heads. The tape offers a smooth non-abrasive surface rather than the formerly exposed particles.

Conventional tape has a tendency to wear off during extended computer operations, and the powdered oxide collects on recording heads, causing signal dropouts.

Another advantage cited for the new sandwich tape is that damage to the tape's thin plastic coating does not harm the recording surface itself. "Ordinary tapes," points out a user of the new system, "are damaged rather easily as the oxide is in direct contact with all friction points."

Unique Radar System Built by Sperry

A microwave radar system which sees "over the horizon" has been built for Air Research and Development Command by Sperry Gyroscope Co. The new system will be used soon to test U.S. air defenses.

Although radar is traditionally limited by the earth's curvature, the new system will be able to track, monitor or remotely control pilotless drone aircraft or missiles over hundreds of miles.

The system uses a special ground direction station that originates commands. These are relayed to a second station located in high-altitude aircraft, which sends the signals the rest of the way to the drone.

Westinghouse Will Build B-70 Defensive System

Air Arm Div. of Westinghouse Electric Corp. will build an electronic defensive system for the B-70 chemical bomber, under a multi-million dollar contract from the Air Force.

A spokesman from North American Aviation, Inc.—prime contractor on the plane—said "the defensive system will make use of electromagnetic and other techniques to make it difficult if not impossible for enemy aircraft or missiles to successfully attack the B-70."

To be powered by six General Electric J93 engines, the B-70 will have a reaction time about one-half of that required for the B-52, according to Lt. Gen. C. S. Irvine, retired AF Deputy Chief of Staff for Materiel. Including fiscal 1959, AF will have spent over $200 million on the program.

New Research Approach Being Tried Out at GE

Weapons system management is being applied successfully to basic research and development work being handled by General Electric Co. While this type of management has been widely used in production-type projects, GE's Heavy Military Projects Dep't Marketing Mgr., R. J. Brown, has pointed out that it is not in general use in research work.

The 212L ACW system is being developed by GE under a project manager, who, "through his system engineering organization specifies the system design, and tasks are assigned to the design groups. These groups no sooner start to work than they start incurring time and expense, and therefore, program control must be exercised immediately by the systems management organization, to make certain that schedules of performance are met and funds allotments are not overrun.

"Our systems management contract includes along with the design of a defense system a delineation of qualitative personnel requirements, training and maintenance procedures and technical information so that the entire system can be evaluated and its operational suitability determined."

Moon Map Made Ready, Distributed by GE

A wall-sized map of the Moon, listing all major landmarks visible from earth, has been prepared and made available for distribution by General Electric Co.'s Missile and Space Vehicle Department.

The map was prepared by General Electric using photography originating at the Lick Observatory. Done in black and white, the map measures 34x44 inches, and includes a close up shot of the moon in the area of Copernicus crater. Also included is a brief write-up on pertinent facts on the moon.

For more facts request No. 55 on reply card.

Newsletter

Armed Forces Management Association

Washington 25, D.C. Phone: OTis 4-7193

National President: Rawlings S. Poole **Executive Director: VAdm. Harry E. Sears, USN, ret.**

Annual Report

With the completion of AFMA fiscal year on 31 May, it is possible to report at this time to the membership and the defense establishment, accomplishments of the Association during the past year and what is planned under Phase II of our expanded program for the year ahead.

Despite the multitude of difficulties inherent in organizing an executive director staff, while undertaking at the same time an ambitious program of activity, the Association enjoyed the best year in its history. Its record of accomplishment is impressive, its finances are in excellent shape and its prestige is growing. Membership is up sharply. We are proud of the record and we salute the many people who made it possible. We take this opportunity to express the Association's great appreciation and gratitude to the Secretary of Defense and the Service Secretaries, and their uniformed and civilian staffs, without whose fine support our record of achievement would not have been possible. Your National Headquarters staff is constantly aware of the trust that has been placed in them. We look forward to the coming year with confidence in our ability to achieve even greater accomplishments in our worthwhile endeavors.

Review of Progress

In condensed form, review of AFMA progress in its various functional fields for fiscal '59 includes:

Plans—Long range planning, projected to Fiscal '63 in effect. New budget and fiscal procedures instituted to insure maximum services for revenues received.

Statistical and analytical services introduced to provide close monitorship of the new program.

A complete overhaul of membership and circulation control underway. New equipment of the latest type has been purchased from capital funds and the services of a well qualified Administrative Officer have been secured. Membership for two and three year periods at reduced rates has been inaugurated to reduce administrative workload at national and chapter level.

Upon the announcement of new national officers for the coming year, an attractive informational brochure on the Association will be prepared and distributed.

Constitution and By-Laws have been revised to conform to AFMA evolution and will be sent to chapters soon for membership approval.

Programs—Numerous projects have been formulated and are in various stages of development:

Industry Advisory Council is now a working part of AFMA and has proven an effective medium for closer liaison between defense and industry in the Defense management field. The outstanding industry session of the National Conference stemmed directly from efforts of this group. IAC will continue its efforts for the coming year generally along theme chosen by it in the Conference—reduction of lead time in production of defense materials and weapons systems.

Educational Institutions Advisory Council is now in Advanced planning stage with a university president as its chairman. Designed to provide a firm liaison for the exchange of management knowledge between Defense and education, it parallels efforts of industry council.

Editorial Advisory Council established. Editorial Board stimulating material for ARMED FORCES MANAGEMENT Magazine and the AFMA JOURNAL.

Program for chapter cooperation with industry at local level now in effect.

Chapter fact finding service has been instituted.

Problem solving service for the corporate membership in the area of defense management related problems now in effect.

Professional Guidance and Education services for the membership established. First project—ICAF correspondence course in executive management available to all AFMA members meeting required standards.

Bibliography of top flight management books and periodicals now being announced from time to time in the *Newsletter*.

Services to the Corporate Membership now includes periodic distribution of latest management ideas as developed in programs of the defense establishment.

Chapter Services—Final chapter of Chapter Manual nearing completion and will be distributed soon.

AFMA seal in color, suitable for framing, distributed to all chapters. Additional copies being prepared for new chapters now in the process of formation.

Chapter kits have been revised and streamlined to facilitate the organizing of new chapters.

Sample chapter programs, drawn from outstanding chapters, have been prepared and distributed to all chapters.

Awards program for outstanding members, chapters, and non-members has been overhauled to provide fuller recognition for those making outstanding contributions in furtherance of AFMA aims and objectives.

Publications—Procedures for insuring finest material for publishing in AFM magazine and the AFMA *Journal* have been developed with objective of making these periodicals the best of their type in the world. A new source of great potential tapped: outstanding theses and presentations from top service management schools. On the horizon, selected material from civilian colleges.

Re-establishment of AFMA *Newsletter* has provided essential link between the National Headquarters and the membership, and a useful medium for dissemination of specialized management knowledge.

National Conference—Individual endeavor, and cooperation of chapters, OSD, Services, industry, and education produced an outstanding event this year in this vital area of management knowledge exchange. Many fine compliments received and sincerely appreciated. The following from a ranking official is typical: "I think the program was outstanding in every way. The selection of speakers was superior. We were particularly impressed with the way in which this organization has matured and the way in which it has begun to operate with fiscal efficiency."

Encouraged by reception of this year's conference, plans are already being formed for next year's production. To provide for greater participation by chapters, '60's conference will be held in the field. A number of bids for sponsorship by outstanding chapters received to date.

Bloodhounds ready for launching during acceptance trials at Woomera

CROWN COPYRIGHT RESERVED

EFFECTIVE DEFENCE

More advanced Bloodhound for defence of UK confirms particular suitability for European defence needs

Already in operational service with the RAF and adopted by non-NATO Sweden, Bloodhound Guided Weapon System is now to be further developed for the RAF.

This developed Bloodhound possesses substantially increased operating range and altitude, with advanced technique ensuring still greater lethality at these increased ranges and heights. Low altitude performance is further improved to counteract the threat of low-flying targets.

Development, rather than replacement, of Bloodhound offers the obvious economic and operational advantages inherent in making use of an existing system.

Proved in many hundreds of test firings; built by Europe's largest missile-manufacturing complex; and particularly suited to European defence needs, Bristol/Ferranti Bloodhound forms *the world's most effective defence system now and for many years to come.*

Security forbids publication of full details, but the following facts about Bloodhound can now be given:—

Power. The Bloodhound is powered by two Bristol Siddeley ramjets—jet engines with no moving parts. Ramjets ensure power and range flexibility, burn kerosene, are simple and safe to handle.

Homing System. Semi-active: i.e., ground crew directs radar beam on to target, which is reflected to a receiver in Bloodhound, ensures highest accuracy—regardless of range. Missiles may be fired, singly or in salvoes, using only one radar.

Airframe. Employs unique and advanced monoplane moving wing configuration—two advantages:—quicker and more precise response, as well as greater accuracy of interception; superior at high altitudes. This configuration was selected at initial design stage to embody maximum development potential.

BRISTOL/FERRANTI
Bloodhound
GUIDED WEAPON SYSTEM

BRISTOL AEROPLANE CO (USA) INC
400 PARK AVENUE, NEW YORK 22, NY

WEAPON DESIGN AND CONSTRUCTION BY BRISTOL · GUIDANCE AND CONTROL BY FERRANTI
TARGET ILLUMINATING RADAR BY BTH · SYSTEM SALES ORGANISATION BY BRISTOL AIRCRAFT LIMITED

Newsletter . . .

Convair Vice President Outlines Keys to Speed

The tools industry must use to cut lead times to the minimum were detailed to this year's AFMA conference by A. C. Esenwein, Executive Vice President of Convair, a General Dynamics subsidiary.

Esenwein said that "to manage modern weapon systems—to bring them to usefulness in time—it is indispensable that our country have compact and identifiable managerial groups, comprised of people with a sense of urgency, with specialized know-how, with full responsibility, and the authority to act swiftly, using short channels of communication."

Esenwein detailed a nine-point list of managerial steps that could be taken to cut present long lead times, in the face of growing weapons system complexity. He told AFMA that (1) all decisions on a given weapon system that can be delegated should be given to a single military individual or a responsible company in industry; (2) decisions should be encouraged at the lowest possible level; (3) the chain of command should have fastest possible up and down communications; (4) these channels should be the shortest possible; (5) unnecessary reports should be eliminated; (6) need-to-know concepts should be eased, perhaps by making them inapplicable within single security levels.

Also, (7) Industry should be more aggressive in seeking information, (8) military and industry should develop greater mutual confidence and communication, to eliminate gaps in these areas. Finally, the Convair executive added "wistfully . . . the establishment of a realistically flexible master program plan, replete with time table, milestones and binding on all organization elements involved."

Management Education Stressed by AF General

Air Force will have to perfect its management practices to fulfill its present mission completely, according to Maj. Gen. L. P. Hopwood, Air Force Director of Personnel Procurement and Training. Hopwood told the AFMA Conference that "the margin for error has been pretty well squeezed out of the Air Force system," and that only the best of management will now be good enough.

Hopwood said that "a good manager used to be one who had enough in his warehouses to cover his planning deficiencies. Now, unless he has planned and managed efficiently, he is quite apt to have to live with his deficiencies, in which case he probably won't last long."

The General said that the Air Force management training program is working in five different phases: (1) availability of management short-courses, (2) specific courses for management within Air Training Command, (3) developing perspective and ability to understand today's problems through such schools as Air War College or AF Command and Staff School, (4) continuing and refined courses run through Air University Institute of Technology, and (5) the existing checks and balances which keep Air Force officers aware of their management responsibilities.

Problem Solving Criteria Outlined by Army Panel

Essential steps in successful hardware development management programs were outlined at the AFMA Conference by an Army panel headed by Maj. Gen. Robert A. Ward, Director of Management Analysis for the Army Comptroller.

The three-man Army Panel pointed out that to solve a given problem it was first necessary to recognize and accept it, organize to solve it, and finally, to appropriately delegate the necessary authority.

Ward said that "continuous attention to the techniques and procedures of management, and a continuing program of self-appraisal and refinement have evolved a management philosophy which has weathered . . . in A-1 condition."

Personnel Problem Solved at Rome ADC

Steps taken to solve an acute civilian personnel problem that had existed at Rome Air Development Center were detailed for the 1959 AFMA Conference by members of the Mohawk, N. Y. chapter of AFMA.

The problem was defined as "an environment in which management did not have an understanding of classification standards, and the Personnel Technicians did not have a good appreciation of the scientific and engineering program."

To alleviate the situation, RADC formed an *ad hoc* committee of key scientific and engineering personnel

"DIVIDENDS OVER THE YEARS" ...*for Military Investors*

More and more military men and women are investing now with a view to providing income and possible growth of principal in years to come. To help them plan their futures, the Armed Forces Department of Harris, Upham & Co. offers a specialized service—a service whose sole purpose is to handle investment programs of military personnel.

These Harris, Upham specialists are now offering, without obligation of any kind, a new and informative investment booklet—it's called "Dividends Over The Years." Directed toward a sensible and conservative approach to investing in common stocks, this publication can assist every serviceman and woman to plan a wise investment program. To get your free copy, simply fill out and mail the attached coupon.

HARRIS UPHAM & CO. BUSINESS ESTABLISHED 1893

ARMED FORCES DEPARTMENT, HARRIS, UPHAM & CO.

Members New York Stock Exchange

1505 H Street, N.W., Washington, D.C., Att. General John E. Dahlquist, USA Ret.

Gentlemen: Please forward promptly a free copy of your booklet "Dividends Over The Years." AM

*Name*_____ *Rank*_____

*Post or A.P.O.*_____ *City*_____ *Zone*_____ *State*_____

INVENTORY CONTROL

Signalled facts
STAY FACTS
with SIG-NA-LOK®
No undesired slipping of signals.

Prevent Losses...
Reduce Costs...
Create Profits...

with **SIG-NA-LOK®**
***SIMPLIFIED* INVENTORY CONTROL**

Sig-Na-Lok visible control puts your inventory at your fingertips. Every fact needed for effective control is signalled and the signals are locked until the facts change. In one complete record, you'll always know exactly what's on hand and when to reorder. Take the guesswork out of inventory — switch to Sig-Na-Lok and you'll

- Prevent over stocks
- Eliminate out of stocks
- Increase turnover
- Decrease costs — increase profits

Creator of Effective Tools for Effective Management

Phone Westport, Conn. CA 7-4111 or write
WASSELL ORGANIZATION, INC.
Westport, Conn.

IN USE IN ALL BRANCHES OF GOVERNMENT
WRITE FOR NEW BOOKLET "SIG-NA-LOK"
SIMPLIFIED INVENTORY CONTROL
or
Consult our GSA Federal Supply Service Contract
FSC Group 74, Parts III & II,
GSA Contract Number GS-00S-18325
Item Number 50-65

For more facts request No. 6 on reply card.

You Get Things Done With Boardmaster Visual Control

- ☆ Gives Graphic Picture of Your Operations —Spotlighted by Color
- ☆ Facts at a glance — Saves Time, Saves Money, Prevents Errors
- ☆ Simple to operate — Type or Write on Cards, Snap in Grooves
- ☆ Ideal for Production, Traffic, Inventory, Scheduling, Sales, Etc.
- ☆ Made of Metal. Compact and Attractive. Over 350,000 in Use

Complete price $49.50 including cards

FREE 24-PAGE BOOKLET NO. AM-40
Without Obligation

Write for Your Copy Today
GRAPHIC SYSTEMS
55 West 42nd Street • New York 36, N. Y.

For more facts request No. 7 on reply card.

and the personnel technicians, charged with reviewing position descriptions in problem areas and establishing technical levels and competence needed in professional scientific and engineering positions.

When it had obtained its basic tools, and used them, the committee reported to the RADC Commander and Scientific Director. Next a group was sent to Langley Field, Va. to study the way in which National Advisory Committee for Aeronautics was handling a similar situation.

On the basis of this, Rome established intermediate classification standards, a top level board to aid non-technical personnel in technical position classification, and use of performance memoranda for professional positions.

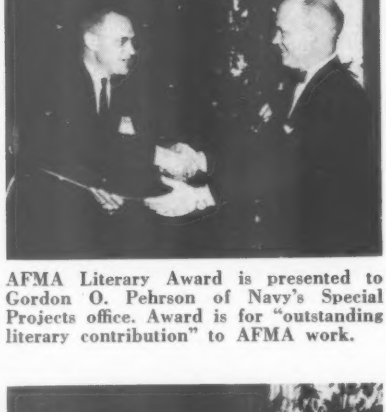
Having set up the new system, Rome has found the following advantages: (1) a centralized point was established where personnel technicians can go for objective technical program evaluation data; (2) performance memoranda now reflect specific areas of work, are reviewed by all management levels, and are based upon actual duties performed; (3) Position descriptions now meet all personnel needs better as they are written by personnel technicians.

AFMA Awards Honor Many

AFMA Service Award for non-member organization was accepted on behalf of American Aviation Publications Publisher Wayne W. Parrish for AFM Magazine.

AFMA Achievement Award was earned by AFMA's Executive Director, Vice Admiral Harry Sears, USN (ret). President Rawlings Poole makes the award.

AFMA Service Award for member organization is accepted by Thomas A. Callaghan, eastern representative for Aeronutronic Systems, Inc., Ford Motor Co.



AFMA Literary Award is presented to Gordon O. Pehrson of Navy's Special Projects office. Award is for "outstanding literary contribution" to AFMA work.

Lt. Gen. Clark Ruffner, Commanding General of U.S. Third Army accepts Honorary Life Membership Award from AFMA President Rawlings Poole.

RAdm. W. H. Leahy accepts Chapter Charter as President of the newly-formed Gosport Chapter #33, located in Norfolk, Virginia.

INVESTOR'S BEST FRIEND AND WORST ENEMY

The American investor's best friend and worst enemy is one and the same thing—the telephone. It all depends.

The telephone is a marvelous instrument. Let there be no doubt about it. It can be especially helpful if you ever invest in stocks and bonds.

If you have a relationship with a reputable broker, you can get on the phone any hour of the day and buy or sell anywhere from five dollars to $5 million worth of securities in well known, established companies simply by giving the word. Knowing you, the broker doesn't need a signed and sealed order. At the same time, you know the broker will carry out your wishes at the best price available in the market.

One telephone call from you to your broker, the clatter of a teletype, another call from a clerk to the floor of the New York Stock Exchange where the public's transactions are carried out, and the whole matter is completed in a matter of minutes. No money has to change hands immediately; no stock certificates have to be waved in the air. You settle up later, conveniently.

But what amounts to the investor's best friend can also become his worst enemy. It all depends on the circumstances.

Most of the promoters who foist phony stock off on their unsuspecting victims generally soften up their customers by mail—but they make the kill by phone.

Why? They do it by phone because they don't like to run the risk of using the mails, and they can hardly do it in person. They usually have no real office—just a hole in the wall full of sweet-talking confidence men reciting their prepared spiels into a battery of telephones. Anybody who saw one of these operations would flee in terror. For another thing, most of these men can't stand close scrutiny themselves.

They call themselves brokers. There isn't any law against that. But they don't behave like brokers, although they try to give you that impression. Instead, they hide behind a telephone and rely on catching a certain number of victims who fail to demand a closer look. In the past some of these fraudulent brokers have bamboozled service families as well.

These brokers talk just beautifully. They promise the moon. They have a way of starting out by letting the victim in on a "good thing" for a few insignificant dollars, and building up the stakes gradually until he hardly realizes that he is committed for every cent he owns.

Anyone at all with any kind of property is likely to get his name on a sucker list—so some day one of these thieves may take out after you. If so, you will be subjected to some of the slickest sales talk you ever heard in your life.

But if you just ask yourself a few quick questions then the gyp broker's cold, clever and calculating approach is easy to spot.

Is he in a hurry? The crooks are always in a hurry. They want to separate you from your money before you have a chance to think twice. The legitimate broker doesn't rush you. As far as he is concerned, if you don't buy today you may buy tomorrow, or next week, or next month. He'll be available.

Does the broker plug one certain stock? The crook always does. The honest broker will suggest stocks, if you ask, but he doesn't high pressure you into buying any particular issue.

Does the broker promise you a profit? The crook will promise anything since he lives on the get-rich-quick instinct so many people possess to some degree. The legitimate broker, on the other hand, makes no rash promises. He knows there are risks and will tell you about them, but he can't and won't guarantee that any given stock is due to rise in price.

Can you check on the broker's reputation? The crook has no real references at all, except maybe some forced ones that won't stand checking. The legitimate broker will stand up under any business investigation you care to make. Often he is associated with a Member Firm of the New York Stock Exchange and listed as such in your classified phone directory under the heading "Stock Brokers." Or else he can be checked with your Better Business Bureau or your bank.

There's no doubt about it. The telephone is the investor's best friend, but it can also become his worst enemy. It all depends.

MONTHLY INVESTMENT PLAN

Hamilton Funds is an investment fund holding stocks in over 80 corporations. Plans as low as $10 monthly.

Hamilton Funds
Dept. H-3
Box 5061, Denver 17, Colo.
Please send me prospectus booklet without obligation.

Name

Address

City State

For more facts request No. 16 on reply card.

Keystone Income Fund
Series K-1

A diversified investment in securities selected for current INCOME.

The Keystone Company
50 Congress Street, Boston 9, Mass.
Please send me prospectuses describing your Income Fund, Series K-1.

Name

Address

City State

N-63

For more facts request No. 15 on reply card.

THE ANSWER TO YOUR FILING PROBLEMS

Saves Time, Labor and up to 40% in Space

CORRES-FILE®

For modern secretaries, Corres-File brings all important papers to her fingertips—as close as her typewriter—making her as fresh at 5 P.M. as at 8:30 A.M. No waste motion — everything's in reach from a seated position.

For the modern secretary and the modern office, install Corres-File and you'll:

• *Cut time in half* • *Save costly labor* • *Increase efficiency* • *Double capacity without sacrificing space*

Patented

Creator of Effective Tools for Effective Management

Phone Westport, Conn. CA 7-4111 or write
WASSELL ORGANIZATION, INC.
Westport, Conn.

IN USE IN ALL BRANCHES OF GOVERNMENT
WRITE FOR NEW BOOKLET "CORRES-FILE"
or
Consult our GSA Federal Supply Service Contract
FSC Group 74, Parts III & II,
GSA Contract Number GS-00S-18325
Item Number 50-65
For more facts request No. 4 on reply card.

STOP COSTLY RE-DRAFTING OF ORGANIZATION CHARTS

THE COFFIELD EVERLASTING
Interchangeable
ORGANIZATION and MANNING CHART

JOB TITLE
EMPLOYEE'S NAME

EASY TO CHANGE
A typist, a typewriter and typing paper are all you need to keep your chart up to date. It's that simple!

• Sizes to Fit Any Organization Structure
• Photographs for Sharp Prints
• Make Fast Spot Changes
• All Parts Are Movable and Re-usable
• In Government Service Everywhere

Write for Free Illustrated Brochure AF-6 or Consult our GSA Federal Supply Service Contract . . . Group 74—Parts 3 and 2 —Item No. 50-63 Cont. No. GSOOS—18238 . . . Code 79.

MANAGEMENT CONTROL CHARTS CO.
1731 N. WELLS ST. CHICAGO 14, ILL.
For more facts request No. 5 on reply card.

The Personnel Problem

(continued from page 15)

consequences, the management indoctrination training job should be given first priority.

2. Measures to use extra-governmental training resources must accompany measures to mobilize the government's resources. They must be equally bold and imaginative for the problem is too large to be met by internal measures. For an optimum program using outside resources, the following measures are recommended.

a. There must be a concerted plan to use outside resources lest government demand swamp certain prime resources while inadequate use is made of others. A central focal point within the government should be established to lead in the planning and brokerage job that is involved.

b. The role of the universities should be maximized now that training legislation and increased capability at universities make this feasible, including, in addition to their traditional role in general education, the use of vocational and "sundown" facilities to share the burden of skill training and management indoctrination.

Contracts should be let to universities to develop courses according to government specifications where existing offerings don't meet the needs.

The university should be regarded as a major resource for developing advanced training programs in both the fields of established sciences and emerging "management science."

Extraordinary expedients, like summer employment of college professors in government computer installations or financing of computer rental on certain campuses for training purposes should be considered.

Possibilities should be considered for a massive program to be run for the government by one or a small number of major institutions analagous to the wartime Statistical Officers' Course developed for the Air Force.

c. Plans should be developed for greater and concerted use of such other outside training sources as Consultants, Associations, and Service Bureaus. Among others: Use of consultants to develop courses on an *ad hoc* basis for specific facets of ADP in which their consulting practice had provided a depth of experience; Place small numbers of key employees with service bureaus to give them a particular type of work experience; Send employees to courses offered by associations.

Careful planning must start now if we are to stand any chance at all of avoiding the impending famine in qualified ADP personnel.

Dates to Circle

July 6-10

Institute in Technical and Industrial Communications—Colorado State University, Ft. Collins.

July 13-17

One-week course for executives and managers on basic concepts in atomic energy and radiation technology presented by U.S. nuclear scientists—simultaneous presentations at Berkeley and Los Angeles, Calif.; sponsored by University of California, University Extension.

Advertiser's Index

Aerojet-General Corp. 1
Air Transport Association 34
American Bosch Arma Corp. 11
Bristol Aircraft, Ltd. 44
Caterpillar Tractor Co. 33
Continental Motors Corp. 41
ElectroData Div. of Burroughs Corp. 2
Electro Tec Corp. 4
Graphic Systems, Inc. 46
Hamilton Management Corp. 42, 47
Harris, Upham & Co. 45
Keystone Co., The 47
Lear, Inc. 8
LeTourneau-Westinghouse Co. 38
Librascope, Inc. ..... Cover 4
Lockheed Aircraft Corp. ..... 6 & 7
Management Control Charts Co. 48
Martin Co., The 28, 29
National Cash Register Co., The 26
Northrop Corp. ..... Cover 2
Philco Corp., Govt. & Indust. Div. 37
Radio Corporation of America ..... Cover 3
Royal McBee Corp. 12
Wassell Organization, Inc. 36, 42, 46, 48
Westinghouse Electric Corp. ..... 21, 22 & 23

AN FITTINGS & HARDWARE
Stainless, Aluminum, Brass, Steel
All sizes-immediate delivery from world's largest shelf stock. Buy direct from manufacturer. Lower prices—quicker service. Send for free wall charts showing complete line of AN & MS fittings and hardware. We also machine parts to your own special print.
COLLINS ENGINEERING CORPORATION
9050 Washington Blvd., Culver City, California

COLOR TECHNICIANS FOR PROFESSIONAL COLOR LABORATORY EXPANSION
Familiar with copy camera techniques, precision enlargers, rack and tank processing, Ektacolor Print Film, Printon, Anscochrome Duplicating Film, Film Processing. Should be presently employed in allied color industry. High school, technical school, college or equivalent. All usual Company benefits. Submit resume, salary requirement, four work references. Relocate to Tampa, Florida, expenses paid. Replies confidential. Color Corporation of America, 43 West 61st St., NYC 23, N. Y.

DYNA-SOAR

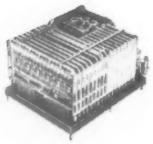
Dyna-Soar (for dynamic soaring) is a joint project between the Air Force and the NASA, and is an attempt to solve the technical problems of manned flight in the sub-orbital regions. Advance knowledge on the project indicates how a boost-glide vehicle can operate from the outer fringes of the atmosphere where it can maneuver and be recovered undamaged. Studies show that by varying the original rocket boost, and thus the velocity, and with the control available to the pilot, the Dyna-Soar aircraft can circumnavigate the earth, followed by a normal and controlled landing. Boeing Airplane Company, one of the competing companies for the development contract for the complete boost-glide system, has delegated to RCA the responsibility for the development of important electronic components of Dyna-Soar.

RCA Tmk(s) ®

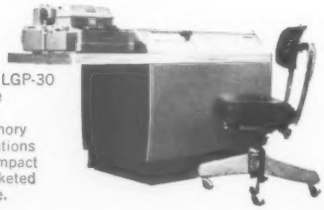
RADIO CORPORATION of AMERICA

DEFENSE ELECTRONIC PRODUCTS

CAMDEN, N. J.



In the missile: small transistorized general purpose digital computer for flight control and guidance. 2000-word magnetic-drum memory.

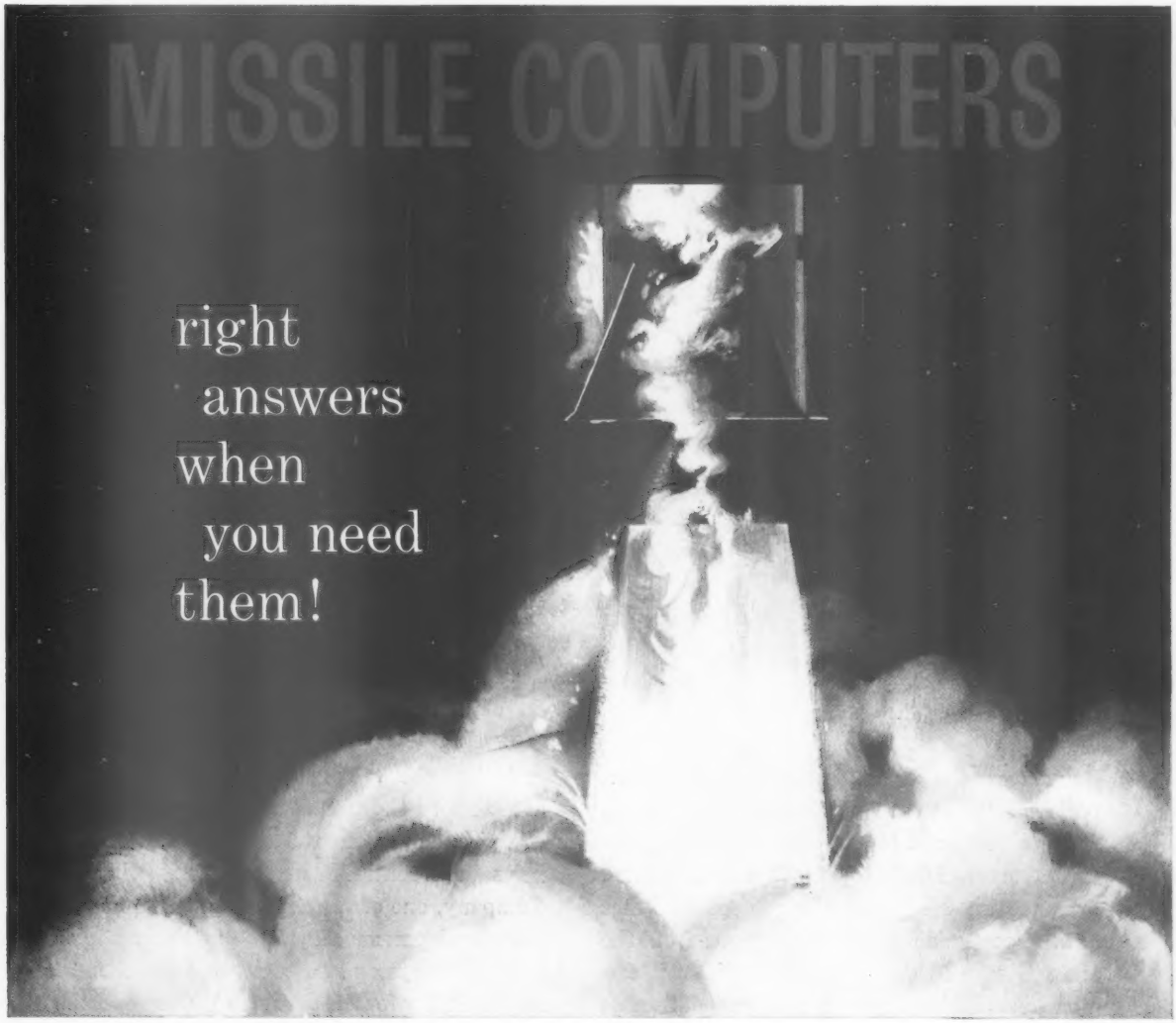


On the ground: LGP-30 general purpose computer with 4096-word memory for such applications as design and impact prediction. Marketed by Royal McBee.

At every stage, the success of a missile program depends upon a computer. Librascope computers, components, instruments and systems give right answers from original concept to final evaluation.

THE FIRST STAGE: Workable designs. **SECOND STAGE:** Trajectory and engineering computations required long before the launching. **THIRD STAGE:** Control, guidance; impact prediction. **FOURTH STAGE:** Data reduction and analysis. ■ Recognizing still a fifth stage, Librascope determines reliability in the lab. Environmental tests check equipment for temperature, shock, vibration, pressure and other "real" conditions likely to affect performance. Only positive answers will release Librascope equipment for field use.

MISSILE COMPUTERS



For information on career opportunities at Librascope, write Glen Seltzer, Employment Manager.

Librascope's technical ability to meet exacting requirements has ably served our many military customers in the development of missile programs. ■ For further information on Librascope's computer capabilities for missiles write:

LI 9-9

LIBRASCOPE

A GENERAL PRECISION COMPANY

LIBRASCOPE, INC. • 808 WESTERN AVENUE • GLENDALE, CALIF. • *A Subsidiary of General Precision Equipment Corporation*